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THE MAGAZINE FOR APPLE II® ENTHUSIASTS

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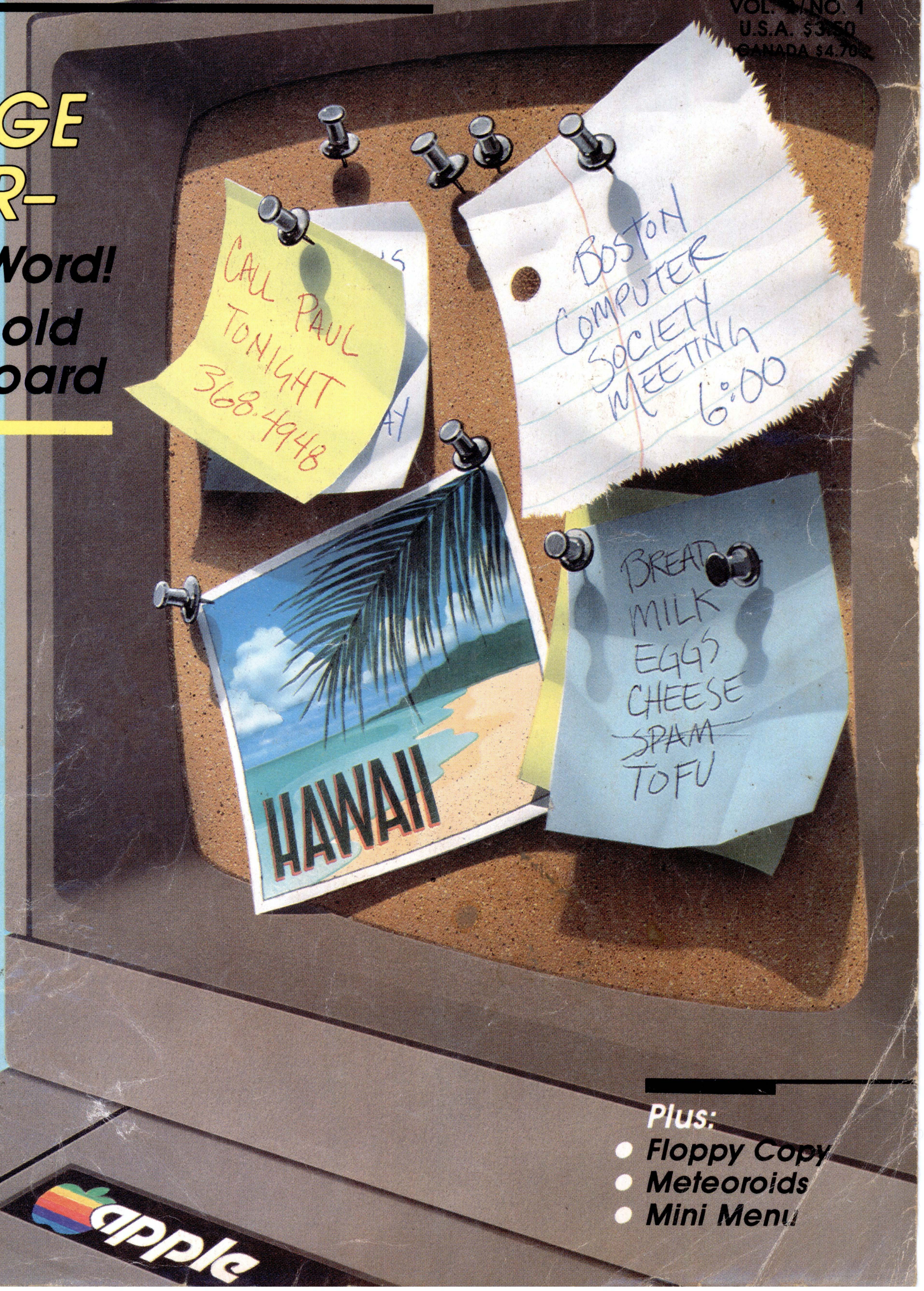
SEVEN READY-TO-TYPE APPLE II PROGRAMS

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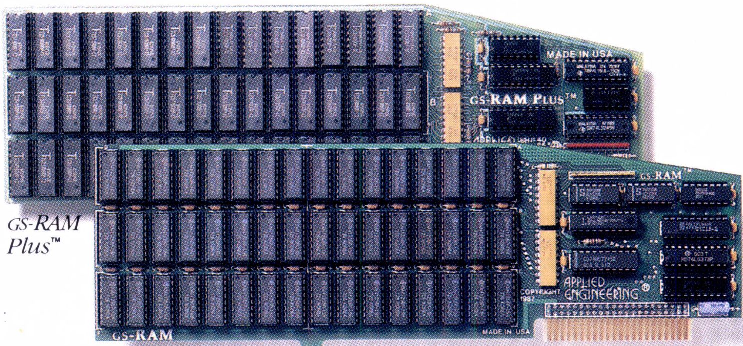
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Making AppleWorks Even Better

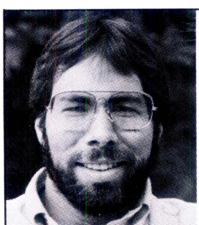
Applied Engineering's Expander program eliminates AppleWorks internal memory limits allowing it to recognize up to 8 megabytes of Desktop workspace. You can increase the limits from only 7,250 lines to 22,600 lines in the Word Processor and from 6,350 records to 22,600 records in the Database. The Expander allows all of AppleWorks, including print functions, to automatically load into RAM. The clipboard size will increase from 255 to 2,042 lines maximum. GS-RAM will automatically segment larger files so you can save them onto multiple floppies. And GS-RAM provides a built-in print buffer that allows you to continue working in AppleWorks while your printer is still processing text. You can even load Pinpoint or MacroWorks and your favorite spelling checker into RAM for instant response.

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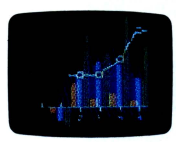
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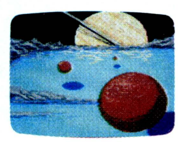
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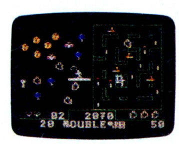
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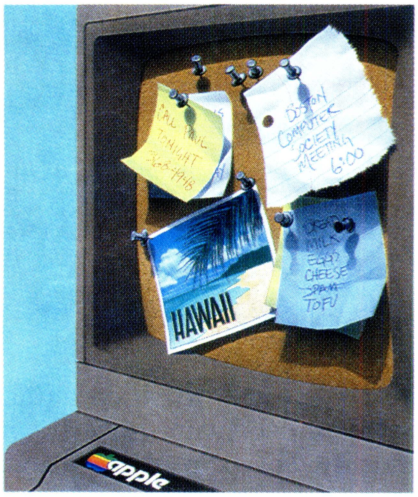
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CIRCLE NUMBER 1

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WORKING SMARTER

TIPS 'N TECHNIQUES

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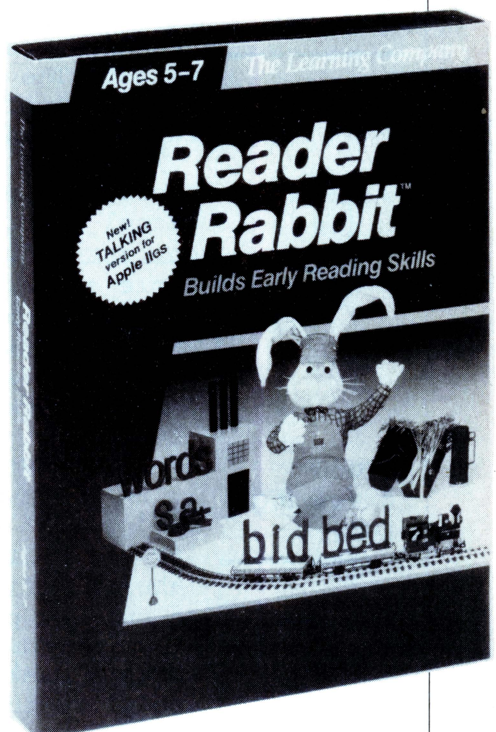
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Raw Data

by Patricia Lesser

Uniform Apples

The Apple IIGS has been selected by the Department of Defense for its school system. The decision was made by Computer Dynamics, a systems integration, support services and training company in Virginia Beach, VA. This was a result of a major government contract award that involves equipping 270 schools for dependents of American military personnel abroad with Apples over the next five years. The Apple IIGS will be used by more than 167,000 children, grades K-12, throughout 23 countries in Europe, Central America and the Far East.

Prizes Grow on Trees

Scholastic (New York, NY) has announced its fourth annual Story Tree writing contest, co-sponsored by Apple. The contest is aimed at recognizing the imaginative talents of students in grades 4-9 who use Scholastic's creative writing program, Story Tree. The students are encouraged to write adventures, mysteries, or unique tales. The winner in each division, elementary or junior high, wins an Apple computer. The winner's teacher will receive an Apple for classroom use.

Apple's in the Chips

Apple enjoyed strong increases in net sales and earnings in the fiscal fourth quarter. Net sales rose to $786.4 million, a 54 percent increase over the corresponding quarter in the prior year. Apple's board of directors declared a cash dividend of $0.08 per share for the quarter ended 9/25/87, to be paid on 12/15/87 to shareholders of record at the close of business on 11/23/87. The board also approved the repurchase of up to 5 million shares of its common stock.

Cross-examining DA's

ON THREE (Ventura, CA) offers The Desktop Manager for the IIGS (512K minimum), an expandable set of desk accessories that can be used by all ProDOS 8 and ProDOS 16 applications. Accessories include a note pad, appointment calendar, calculator, envelope labeler, printer manager, typewriter, ASCII chart and the ability to cut and paste information between different applications easily. Also introduced was the Disk Manager, an add-on accessory for The Desktop Manager that provides the System Utilities program's most useful features.

Finder Found

At last, the IIGS has the new Apple IIGS Finder plus updated System Utilities. The Finder can locate and start applications, organize information, and perform general system functions, all in Super Hi-Res color graphics. The Finder uses mouse and icon interfaces, and requires at least 512K RAM. Because it's a ProDOS 16 application, it runs only on the GS. If your system was purchased before the Finder was available, an authorized Apple dealer can update your system disk free of charge.

New and Rumored

Activision (Mountain View, CA) has lifted copy protection from the company's creativity and productivity software. The entertainment programs are still under guard, so to speak....Various tracking agencies have come to a unanimous conclusion. Recreational software currently ranks fourth in sales of all software. Word processors, database managers, and spreadsheet programs are the three best-sellers....Strategic Simulations (Mountain View, CA) has announced a contest in which players of its President Elect-1988 Edition whose electoral count comes closest to the actual election will win a cash award of $1,988.

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A WELCOME TO NEW NIBBLE READERS

Welcome to *Nibble*, the magazine for Apple II enthusiasts. In each issue, you'll find a wealth of things to do with your Apple. You'll find programs that are complete, debugged, and ready for you to type in and use. You'll find reviews of the latest in Apple software and hardware. (Our reviewers' opinions will be an invaluable aid in making your purchasing decisions.) And you'll find "how to" articles that will help you make better use of the software that you already own. With a focus on popular software such as AppleWorks and Apple Writer, you'll find templates and tips you can use in our Working Smarter section.

Nibble has built its reputation by presenting high quality, ready-to-type Apple II programs for over seven years. Each program is accompanied by an article that begins by fully describing the use of the program. It then gives complete directions for typing in and saving the program on disk. If you want software you can use, those two sections have all you'll need. Just read the general directions for typing programs in the Typing Tips section and you're off! You don't need to understand the programming techniques to use the programs. And if you'd rather not type in the programs, most are available on disk. (See the Nibble Software Catalog for details.)

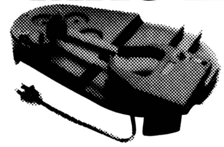
For those who want to tinker or to learn more about programming, the articles include sections on how the program works and how it can be modified. If you're new to programming, you may want to save these sections for later, or just scan them briefly.

As a *Nibble* reader, you're an important member of a community of Apple II enthusiasts. Your voice is important in shaping *Nibble*, and we hope we'll hear from you. Please let us know your thoughts by writing to us or by filling in the Reader Feedback section of the bound-in postcard in this issue.

Thank you,
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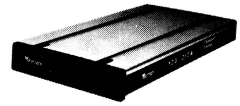
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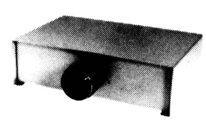
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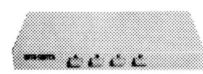
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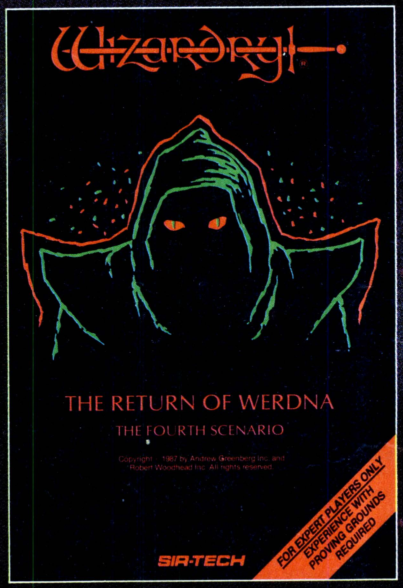
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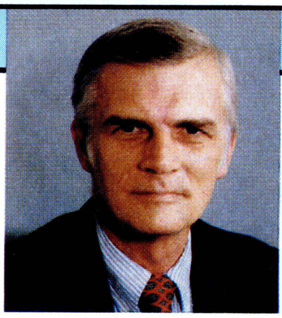
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CIRCLE NUMBER 3



PROCESS — THE ENEMY WITHIN

With this issue, we are entering our ninth year of publication. It has been, and continues to be, an exciting time — and we are very grateful for your support and encouragement. That support has allowed us to continue as the last independent publisher of Apple-specific magazines. It means a lot to all of us.

Over the past year, the Apple IIGS has planted strong roots for the future. New products have begun to bridge the gap between the Apple II and the Macintosh. A number of companies have come and gone. The market has alternated between euphoria and cold fear. And we have been reminded of some important lessons in management.

THE PROCESS

Businesses need procedures and policies to operate. The larger a company becomes, the more likely it is to define, document, and implement step-by-step processes for getting things done. As the manuals, control sheets, and project boards grow in number and complexity, the business bogs down. In its worst form, the original intent of the process — the result — can be forgotten as the process itself begins to dominate. Process then becomes an enemy from within — an insidious evolution.

Steps Add Time

Procedures involve incremental *steps* to get the job done. Here's one example. When you develop a new advertisement for your product, you'll exercise some form of tracking system:

Process Step	Date
Project Launch	
1. Draft Copy	Day 1
2. Review	______
3. Design Layout	______
4. Review	______
5. Edit Copy	______
6. Typesetting	______
7. Proof Galleys	______
8. Ad Layout	______
9. Review	______
10. Camera Ready	______
11. Review	______
12. Mail Date	______

These procedures are typical of many kinds of projects that move from concept to the finished result, particularly if the projects involve different people. They can be applied to products, promotions, and any other projects initiated in your business or profession.

The One-Day Minimum

If each step in the procedure requires a sign-off by a different person, you can imagine what happens when an attempt is made to *schedule* the project. Here's a typical response to a proposed scheduling of a project:

1. I don't know what I'll be doing on the day I handle the project.
2. I don't know what other priorities will conflict with it.
3. I don't know how long it will take to do my part.
4. I don't know whether I'll get it early or late in the day.

And here's how each person thinks about filling in the schedule dates.

1. If it's a small high-priority project, I'd better allow at least *one* day to handle it.
2. If it's a larger complex project, I'd better allow two to three days to handle it.
3. I'm not sure how long it will take, so I'd better add 20-30 percent more time just to be on the safe side.

By the time the project schedule is completed, at least *one working day* will have been allocated to *each step*. By this measure, *no project can be completed in less than 12 working days*. The process dominates the implementation, and you begin to wonder why it takes such a long time to get even the smallest things done.

Worse yet, if one of the dates happens to overlap another high-priority task, the time gap expands dramatically so that the conflicting task can be completed first. As the days add up, you may even conclude that it *cannot be done* in the time available. It happens . . . all too often.

RESULTS

The alternative is *not* to throw out procedures and policies. To do so invites errors, jeopardizes quality, and throws an array of multiple projects into chaos. But it is imperative to remind yourself and your people frequently that the *result* is what it's all about. You can then design or redesign procedures and concentrate on the result. A useful approach is to compress the procedure by combining steps. You could restructure the previous example as follows:

Completion Steps	Date
Project Launch	
1. Draft and Edit	Day 1
2. Design	______
3. Typeset and Proof	______
4. Preliminary Layout	______
5. Final Result	______

The review steps still exist. Although they are verbalized and given high priority, they are not explicitly scheduled. The major steps have been preserved, but a 12-step procedure has been reduced by 60 percent. Note also that the steps have been renamed "Completion Steps" to focus on results. Finally, those involved will have more flexibility to integrate the project effort into their other daily responsibilities while maintaining a clear eye on the completion target.

THE END RESULT

Virtually every complex endeavor involves step-by-step execution. But even the best efforts to define, document, and implement the process can be deadly, leading to frustration, delays, and added cost. And the process may even destroy the very efforts it's attempting to control.

Process must serve the result — not itself. Unchallenged process feeds on itself and becomes a monster. Taming it can mean the difference between profit and loss . . . and even survival.

Mike Harvey

Mike Harvey,
Publisher

by Brent Iverson

HI-RES CIRCLE GENERATOR

Here's a fast Hi-Res circle drawing routine. Just POKE in the center coordinates and radius and CALL it.

Several months ago, I discoverd a neat little circle-generating algorithm in a graphics textbook. The routine worked entirely with integers; furthermore, it needed no multiplication (other than by powers of 2) or division. I converted the algorithm into a short Applesoft program that will draw a Hi-Res circle in any Applesoft HCOLOR (**Listing 1**). It worked, but it was very slow.

The algorithm was obviously written to be easy to program in assembly language. I tried converting it, but there was one major complication. If the program was to be any use at all, it had to deal with numbers from 0 to 32767, the normal Apple integer range. This meant that my variables would have to be 16-bit, not just the usual 8-bit kind. Anyone who has tried to work with 16-bit numbers on an 8-bit processor like the 6502 knows just how tedious this can be.

The amount of code required for simple operations such as addition, subtraction, and comparison of 16-bit numbers is more than double that required for 8-bit numbers. Suddenly, this short, neat little algorithm seemed much larger than before. I needed the speed of assembly language, but didn't want to go to the trouble of coding all these 16-bit operations.

The Assembler/Macrosoft was just what I needed to write this program. It allowed me the speed of assembly language, but didn't require writing out the code for many 16-bit operations. Macrosoft is a set of BASIC-like macros for use with MicroSPARC's Assembler. Using the machine language subroutine, you can draw a Hi-Res circle in any Applesoft HCOLOR (**Listing 2**). The circle may be partially or entirely off the screen, because the program will never try to draw a point outside of the screen limits. It can be positioned at any integer X,Y coordinates (−32768 to 32767), and can have a radius of 0 through 32767. Although the program was written with The Assembler/Macrosoft, you can enter just the code from **Listing 3**.

Brent Iverson, 555 E. William #18K, Ann Arbor, MI 48104. The programs are compatible with both DOS 3.3 and ProDOS.

HOW TO USE THE ROUTINE

The routine is just above Hi-Res page 2, so it can be used to draw on whichever Hi-Res page you want. Since this program is designed for integers from −32767 to 32767, any numbers larger than 32767 will "wrap around" to −32767 and any numbers smaller than −32767 will wrap around to 32767. This means that if your circle's center coordinates (X or Y) plus or minus the radius exceed either of these limits, you may get unexpected results when you draw the circle.

The Apple video hardware can't plot all colors at all horizontal coordinates. To avoid this, if you may find that is you are drawing the circle in a non-white color, it may appear broken or incomplete, especially on the right and left edges. Just draw two circles — one with a radius 1 larger than the other. This will make the entire circle look thicker and more solid.

Listing 4 is an Applesoft demonstration program which shows how to call the circle-drawing routine, and uses it to draw a number of circles of different colors and sizes.

To call the program from Applesoft or machine language, you must put the center (X,Y) of the circle and the circle's radius into memory locations 768-773 ($300-$305). The horizontal coordinate of the center goes into 768-769, in standard Low-High format. The vertical coordinate of the center goes into 770-771 (same format), and the radius goes into 772-773.

If you are calling the routine from machine language, you already know how to separate a number into its low and high bytes. If you are calling it from Applesoft, the functions A and B in **lines 160-170** of **Listing 4** will do this for you. Don't use the functions with any numbers higher than 32767 or lower than zero!

Lines 540-570 show how to use functions A and B to put the parameters into memory, then call the circle-drawing routine.

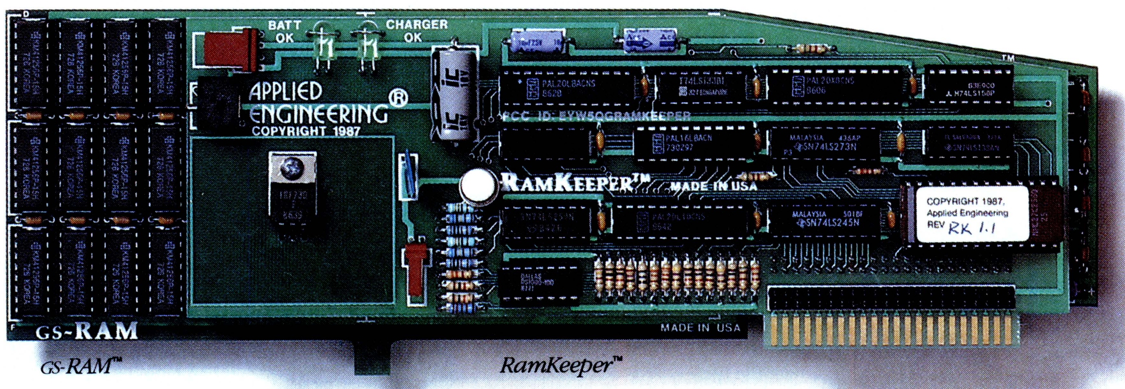
ENTERING THE PROGRAMS

Enter **Listing 1**, the BASIC version of the circle routine, and save it with the command:

SAVE BASIC.CIRCLE

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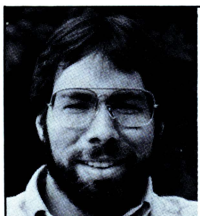
Now when you turn on your IIGS your favorite program can appear on screen in just a few seconds! With RamKeeper, your IIGS memory card will retain stored programs <u>and</u> stored data while your IIGS is turned off. RamKeeper allows you to divide your IIGS memory into part "electronic hard disk" and part RAM for your programs workspace—in almost any way you want and at anytime you want. GS-RAM, GS-RAM Plus, Apple IIGS memory card and most other IIGS memory cards are compatible with RamKeeper.

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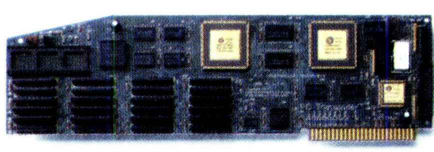
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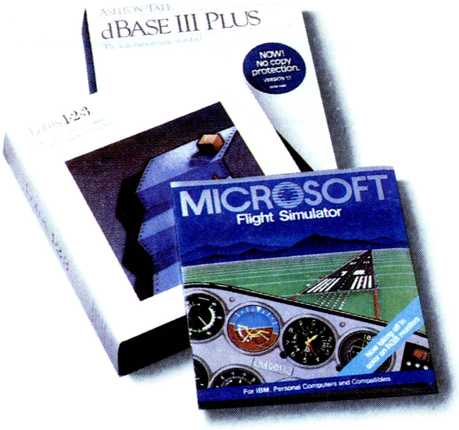
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PC Transporter taps into the world's largest software library. Now your Apple can run most of the IBM software you use at work. And it opens a new world of communications programs, games and bulletin boards.

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PC Transporter supports 3.5″ and 5.25″ MS-DOS and ProDOS formatted diskettes. You'll shift instantly between Apple ProDOS and IBM MS-DOS.

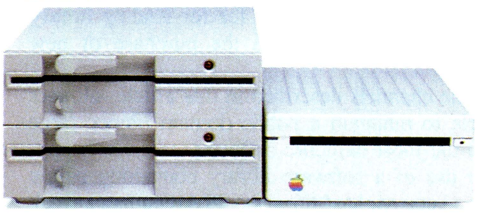
You'll need our versatile 5.25″ 360K drive system to run IBM applications from 5.25″ floppy disks. Use your Apple 5.25″ drive for Apple 5.25″ disks.

An Apple Disk 3.5 Drive will support the new 3.5″disks whether they're IBM MS-DOS formatted or Apple ProDOS formatted. The PC Transporter acts like an Apple Disk 3.5 Drive disk controller for IIGS, IIe, and II Plus users.

PC Transporter supports up to 5 drives in a number of combinations.

For example, you can connect a 5.25 Applied Engineering 360K dual-drive system directly to the card. Then plug two daisy-chained Apple 3.5 Drives (not the Apple UniDisk 3.5) to the dual-drive system. For a fifth drive, use a ProDOS file as an IBM hard disk.

PC Transporter controls Apple and IBM compatible disk drives. It supports 3.5″ and 5.25″ MS-DOS and ProDOS formatted diskettes.



Versatile data storage.

PC Transporter reads MS-DOS and translates it into Apple native ProDOS. You can store IBM programs and data on any ProDOS storage device including the Apple 3.5 Drive, Apple UniDisk™ 3.5, Apple 5.25″ drive, SCSI or ProDOS compatible hard drives. (You can use the Apple UniDisk 3.5 with its own controller card for storing programs and data, but not for directly booting an IBM formatted disk.)

You can even use our 360K PC compatible drive for ProDOS storage and a 143K Apple 5.25″ drive for MS-DOS storage.

Make your Apple speak IBM.

PC Transporter memory choices.

RAM in Apple mode:	RAM in IBM mode:	Price:
384K	**256K**	**$489.00**
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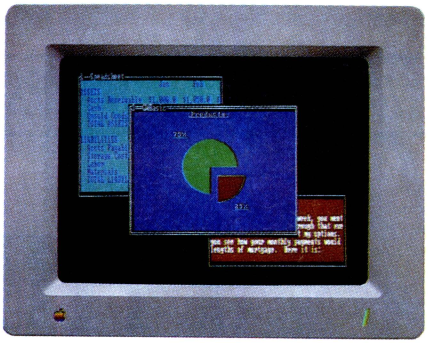
Note: The IBM mode is 128K less because the PC Transporter uses 128K for system memory.

IIGS Installation Kit	**49.00**
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THE SOFTWARE CONNECTION

Without software, what good is a computer? In the early days of personal computing, software was virtually nonexistent. If you wanted software, you had to write it yourself. Usually, this homegrown software found its way into the public domain and onto clubs' disks of the month. These disks served as a major fund-raising tool for most groups. By charging copy or distribution fees, the groups were able to raise money to support their activities. Today, with the enormous amount of commercial software available, the public domain software river is drying up — and so are user groups' treasuries.

PUBLIC DOMAIN TITLES

User groups must constantly explore new avenues to obtain software for their libraries. One way of procuring public domain titles is by exchanging homegrown disks of the month with other user groups. Many organizations will trade on a one-to-one basis. If your group is just starting out and does not have any software, contact other groups and inquire about purchasing their libraries. Some clubs may want cash, but others may only ask for blank media. With the falling cost of diskettes, trading disks for software can be a great deal.

Another source of public domain titles is from on-line communication services, such as GEnie, CompuServe, and The Source. They provide download libraries, which are grouped by topic — games, telecommunications, AppleWorks, etc. — for most popular microcomputers. Keep in mind that various rates are charged for connect time. Downloads can take a large chunk out of the club treasury or the software librarian's wallet.

There are quite a few mail-order businesses that deal with public domain software. These companies offer a large selection and will sell a disk of programs for between $2 and $5. The quality of the software will vary widely. Some companies thoroughly debug all of their public domain software before releasing it to the public. Others release the software on an ''as-is'' basis — maybe it works and maybe it doesn't!

For $95 a year, an Apple user group can become a member of the International Apple Core. The I.A.C. will provide your group with public domain disks on a somewhat regular basis. If your organization cannot afford the fee, you may want to contact your local library to see if they maintain a public domain software collection.

No matter where or how your group obtains its public domain titles, it's imperative that the software being distributed is in the public domain and is not copyrighted software. In recent months, quite a few copyrighted titles have turned up on user groups' disks. If a program starts up with a copyright notice, check the program's origin. If the program is written in BASIC, the author may have included his or her phone number and/or address in the program listing. Give the author a call or write a note. It's better to do some early checking than to deal with one author's attorney at a later date.

SHAREWARE

The decline in new public domain software titles has been countered with an increase in ''shareware'' software titles. Shareware is software that you can try before buying. Normally, the shareware developer will place a trial period of about two weeks on the software. If you like the software, then you are required to send a specified license fee to the author. If you don't care for it, then you are supposed to delete the program file(s) or reformat the disk.

Shareware authors usually post their programs on bulletin board systems or with on-line communication services. Some developers send their disks directly to user groups that have registered with Apple Computer. No matter what approach is used, you are encouraged to share a copy of the program with your friends or with your user group.

Shareware presents a unique problem for user groups when setting the club's copy charge for disks. Most shareware authors permit user groups to charge up to $5 for a copy of their software. If a group has a $5 copy charge and a user wants a shareware title, what is the club's responsibility, if any, to the user who elects not to use a shareware package? The user has now paid $5 for a blank disk! What about the user who does decide to use the package and mails in his registration fee? He has now paid $5 more for a program that he could have purchased directly from the author. In either case, the user group member is getting the short end of the stick. No shareware developer, to my knowledge, reduces his licensing fee if his software is obtained through a user group.

COPYRIGHTED SOFTWARE

Most copyrighted software cannot be distributed on disks of the month; however, some companies do provide demo disks to be copied and distributed. By doing so, the software manufacturer gets inexpensive advertising and the club can collect some much needed revenue.

A growing trend among user groups is the establishment of a Software Lending Library. Throughout the year, the club will purchase new software titles or receive complete working demos from software manufacturers. These programs are then loaned to club members in the same way that books are obtained from the public library. A user can then preview a program before making a purchase. Some groups provide this service to their members as part of their membership fees. Others groups may charge an annual fee for lending library privileges. Usually, this fee goes toward the purchase of new software.

By using some of the channels described in this article, all user groups should be able to maintain a public domain library large enough to keep even the most hardcore software collector happy. In turn, the creative use of a software library containing public domain, shareware, and copyrighted titles should strengthen a weak treasury.

Rudy A. Guy, 1319 W. 10th St., Erie, PA 16502.

LETTERS

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SHAPE TABLE TRICK

Here's a very short 16-byte routine (Listing 1) that makes it unnecessary to keep a record of the beginning address of a shape table. Instead of BLOADing the shape table (as you would normally), and then POKEing its address into locations 232 and 233 ($E8 and $E9), simply BRUN the table, with this routine attached, anywhere in memory.

When a machine language program is BRUN, its beginning address is found in locations $AA72 and $AA73. This routine simply adds 16 to this address, since the shape table begins 16 bytes after the routine itself, and stores the result in the shape table pointers ($E8 and $E9). This works with an Apple II and DOS 3.3.

Suppose your shape table has a length of *y* bytes. Place this routine in memory at location *x*. BLOAD your shape table at location (*x*+16). Then BSAVE the whole thing, address *x*, length (*y*+16). Next time you use it, just BRUN it.

This routine is so short and simple that it can be typed in less time than it takes to boot a disk.

Ingram McCallum
Ontario, Canada

RENEWING RESTORE

Have you ever wanted to RESTORE a certain DATA statement among many lines of DATA statements?

The only way to do this in Applesoft is to READ and discard the unwanted values

continued on page 118

17 Meg IIe/1 Meg IIc

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Famous Course Disk Vol. 2	12.
Famous Course Disk Vol. 3 & 4	22.
Dam Busters, Fight Night, Accolade Comics or Hard Ball	22.
Killed Until Dead	22.
Activision Aliens	24.
GBA Championship Basketball *(IIGS)*	31.
GFL Championship Football	27.
Hacker II or Hacker II *(IIGS)*	27.
Might & Magic	34.
Portal or Shanghai *(IIGS)*	30.
Star Rank Boxing II	28.
Tass Times In Tonetown *(IIGS)* or Maniac Mansion	24.
Top Fuel Eliminator	21.
Artworx Artworx Bridge 5.0	21.
Broderbund	
Airheart or Wings of Fury *(IIe, IIC, IIGS)*	24.
Championship Lode Runner or Karateka	24.
Ultima IV or Ultima V	42.
Autoduel	34.
Moebius	42.
Data East Karate Champ or Kung Fu Master	15.
Tag Team Wrestling or Commando	24.
DataSoft/Electronic Arts	
Alternate Reality "The City"	22.
Bruce Lee, The Goonies, or Zorro	18.
Electronic Arts	
Bard's Tale *(IIGS)*, Instant Music *(IIGS)*, or Music Construction Set *(IIGS) (each)*	39.
Bard's Tale II, Carriers At War, Europe Ablaze or Starfleet I *(each)*	34.
Amnesia, Bard's Tale, or Robot Rascals *(each)*	32.
Alternate Reality: The Dungeon, Arctic Fox, Battlefront, Battles in Normandy, ChessMaster 2000, Legacy of the Ancients, Mavis Beacon Typing, Russia The Great War, Scrabble, PHM Pegasus or World Tour Golf *(IIGS) (each)*	29.
EOS: Earth Orbit Station, Bismark, Strike Fleet, or Marble Madness *(each)*	25.
Dark Lord or Force 7	16.
Adventure Construction Set, Lords of Conquest, Make Your Own Murder Party, or Realm of Impossibility *(each)*	12.
EPYX Championship Karate	21.
California Games *(IIe or IIGS Version)*	26.
Championship Wrestling or Destroyer	26.
Rad Warrior	18.
Summer Games II or Winter Games	26.
Sub Battle Simulator or Omnicron Conspiracy	26.
Street Sports: Basketball or Street Sports: Baseball	26.
Temple of Apshai Trilogy	15.
World Games, World Games *(IIGS)* or Destroyer *(IIGS)*	26.
Sub Battle Simulator *(IIGS)* or Winter Games *(IIGS)*	26.
The Movie Monster Game	15.
World's Greatest Baseball Game or Football Game	15.
Firebird Licensees, Inc. Elite	24.
Guild of Thieves	28.
The Pawn	31.
Hayden Software Sargon III	15.
Infocom	
Bureaucracy, Hitchhiker's Guide, Hollywood Hyjinx, Leather Goddesses Of Phobos, Nord & Bert, Plundered Hearts, Stationfall, The Lurking Horror, or Zork I *(each)*	27.
Beyond Zork *(II+, IIe, IIc)*	34.
Beyond Zork *(IIGS)*	34.
The Zork Trilogy	46.
Micro League Sports Micro League Baseball	27.
General Manager/Owner Disk	27.
Microprose F-15 Strike Eagle or Silent Service	23.
Mindscape	
Defender of the Crown *(Apple IIGS)*	32.
Balance of Power	32.
Sub Mission	27.
Super Ice Hockey	28.
Sinbad, S.D.I. or King of Chicago *(IIGS)*	32.
Indoor Sports, Uridium, or Xevious	21.
Infiltrator or Bop 'n' Wrestle	21.
One Step Software	
Golf's Best Pinehurst or St. Andrews	15.
PBI Software The Tower Of Myraglen *(IIGS)*	34.
Strategic Conquest II or Cavern Cobra *(IIGS)*	31.
Sea Strike *(IIGS)*	25.
Random House APBA Major League Baseball	41.
Sierra On-Line	
Space Quest or Space Quest *(IIGS)*	34.
Championship Boxing	24.
Kings Quest I, II, or III *(APII or IIGS Ver.)*	34.
Leisure Suit Larry *(IIGS)*	27.
Thexder *(IIGS)*	24.
The Black Cauldron	27.
3-D Helicopter Simulation *(IIGS)*	34.
Simon & Schuster	
Star Trek *(Kobayashi Alternative)*	27.
Star Trek *(The Promethean Prophesy)*	27.
Sir-Tech Wizardry	32.
Knight of Diamonds	32.
Legacy of Llylgamyn	32.
Deep Space-Operation Copernicus	27.
Spectrum Holobyte Gato	12.
Gato *(IIGS)*	25.
Intrigue or Lunar Explorer	18.
Orbiter *(IIGS)* or Wilderness	31.
Strategic Simulations	
Battle For Normandy, Broadsides, Colonial Conquest, Gemstone Warrior, Geopolitique 1990, Imperium Galactum, NAM, Phantasie II, Phantasie III, Rails West, Ring's of Zilfin, Roadwar 2000, Realms of Darkness, Roadwar Europa, Shard of Spring, The Eternal Dagger, or Wizard's Crown *(each)*	28.
Battle Cruiser, Battle Group, Kampfgruppe, Mech Brigade, North Atlantic '86, Sons of Liberty, Warship, or War in the South Pacific *(each)*	40.
Battle of Antientam or Chickamunga	34.
Gemstone Healer	21.
War in Russia	55.
Sublogic Flight Simulator II	36.
Jet	30.
Scenery Disks 1-3 *(ea)*	16.
Baseball	38.

Utilities & Languages

Item	Price
Apple Computer Apple II Instant Pascal	119.
Apple Pascal V1.3	215.
Beagle Brothers	
Beagle Screens, Big U, MacroWorks, or Pro-Byter *(each)*	21.
Beagle Compiler	46.
Beagle G.P.L.E. or Super MacroWorks	31.
D-Code, Extra K, Power Print or Triple Dump *(each)*	25.
Borland Turbo Pascal 3.0 *(Req. CP/M)*	47.
Turbo Database Tool Box	47.
Turbo Tutor	23.
Funk Software Sideways Prodos & Dos 3.3	47.
Roger Wagner SoftSwitch *(IIGS)*	40.
Merlin 8/16 *(II+, IIe, IIc, IIGS)*	79.
Merlin Assembler	44.
Merlin Combo Pack	69.
The Byte Works ORCA/Pascal *(IIGS)*	89.
ORCA/M 4.1	72.
ORCA/M GS	49.
The Software Touch AutoWorks or Fontworks	34.
Program Writer	34.
Font Disk #1 for FontWorks	20.
TML Systems TML Basic for the GS	89.
TML Pascal for the GS	89.
TML Source Code Library for the GS	35.
TML Speech Toolkit	49.
TML Pascal APW	89.

Graphics Packages

Item	Price
Accolade Graphics Studio *(IIGS)*	42.
Activision Draw Plus *(Not Protected IIGS)*	59.
Paint/Write/Draw *(Not Protected IIGS)*	115.
Clip Art Gallery *(Req. PaintWorks Plus IIGS)*	21.
Gary Kitchen's Game Maker	34.
GameMaker "Designer's Library" Sports	18.
GameMaker "Designer's Library" Sci-Fi	18.
PaintWorks Plus *(Not Protected IIGS)*	59.
Postcards *(IIGS)*	24.
Postcards *(IIe & IIc)*	18.
Music Studio *(IIGS)*	59.
Greeting Card Maker	28.
Bantam Software	
Walt Disney Card & Party Shop	27.
Walt Disney Comic Strip Maker	27.
Baudville 816/Paint *(Works On All Apples)*	46.
Award Maker Plus	24.
Take 1 Deluxe	36.
Beagle Brothers Beagle Graphics	36.
Minipix Disk #1, #2 or #3 *(each)*	19.
Shape Mechanic	25.
Broderbund Toy Shop	34.
Toy Shop Refill	18.
Animate	45.
Dazzle Draw	39.
Drawing Table *(IIGS)*	62.
Print Shop Enhanced or Fantavision	32.
Print Shop *(IIGS)* or Fantavision *(IIGS)*	42.
Print Shop Companion	25.
Print Shop Graphics Library I, II, III or Holiday Ed.	16.
Print Shop Paper Refill	14.
Show Off *(IIGS)*	42.
DataPak Graphicwriter IIGS	99.
Data Transforms Fontrix 1.5	62.
Printrix 1.0	47.
Font Paks 1-15 ea.	14.
Electronic Arts Movie Maker	12.
Deluxe Paint II *(IIGS)*	79.
Video Title Shop	23.
Art Parts 1, Art Parts II or Seasons & Holidays *(IIGS)*	26.
EPYX Printmagic	41.
Graphics Scrapbook Chapter #1, #2, or #3	17.
Create-A-Calendar	21.
Intracorp Business Card Maker	36.
The Video Wizard	36.
PBI Software Visualizer IIGS	59.
Visualizer IIe	55.
Scholastic SuperPrint *(IIGS)*	31.
Spinnaker T-Shirt Shop	32.
T-Shirt Shop Graphics	15.
Springboard	
Springboard Publisher *(IIe, IIc, IIGS)*	79.
Newsroom	35.
Certificate Maker	26.
Certificate Maker Library #1	20.
Fonts For Springboard Publisher	26.
Newsroom Clip Art Collection Vol. 1 or 3	18.
Newsroom Clip Art Collection Vol. 2	25.
Graphics Expander Vol. 1 or Laser Drivers	25.
Style Sheets/Newsletters	19.
Works of Art Education, Holidays or Assortment *(each)*	26.
StyleWare, Inc. TopDraw *(IIGS)*	59.
Unison World Printmaster Plus	31.
Art Gallery I or Art Gallery II	19.

Communication Software

Item	Price
Checkmate Technology	
ProTerm *(IIGS, IIe, IIc)*	79.
Compuserve Compuserve Starter Kit	24.
Pinpoint Point To Point	79.
PBI Software Commworks *(IIe & IIc)*	65.
Softronics	
Softerm 2	159.
United Software Industries	
ASCII: Express Pro: Prodos or Dos 3.3	75.
ASCII: Express Mousetalk	59.

Business Software

Item	Price
Activision	
Writer's Choice Elite *(Not Protected IIGS)*	62.
List Manager *(Merges w/Writer's Choice IIGS)*	62.
Advanced Logic Systems SpellWorks	31.
Apple Apple Works *(IIe, IIc, IIGS)*	215.
Apple Writer *II* 2.0 ProDos *(IIe, IIc)*	125.
Beagle Brothers Timeout Graph	55.
Timeout SuperFonts	49.
Timeout QuickSpell	45.
Timeout UltraMacros	37.
Timeout SideSpread, FileMaster, or DeskTools	32.
BPI Systems	
(Accounting Systems for the IIe, IIc & IIGS)	
BPI General Accounting ProDos	159.
BPI AR/AP or Inventory ProDos *(ea.)*	159.
BPI Payroll ProDos	159.
Broderbund On Balance	65.
Bank Street Writer *Plus*	54.
Computer Associates SuperCalc 3a	129.
Dac Software Dac-Easy Accounting	69.
Datapak Notes & Files *(IIGS)*	79.
DHA Systems Software FastPak Mail	42.
Intuit Quicken	35.
Manzanita ***BusinessWorks***	
System Manager *(Required)*	65.
GL/AR/AP/ or Inventory Control	239.
Payroll Module	239.
MECA	
Managing Your Money 2.0 *(IIe, IIc, IIGS)*	99.
Megahaus MegaWorks or ThinkWorks	38.
Monogram Dollars and Sense *(II+, IIe or IIc)*	75.
Nolo Press Will Writer *(Version 2.0)*	32.
Peachtree Back To Basics Accounting System: *GL/AR/AP*	135.
Pinpoint Publishing	
Pinpoint IIGS Starter Kit	89.
Pinpoint	49.
PinPoint Spelling Checker	45.
PinPoint Document Checker	45.
PinPoint Speller/Document Checker Combo	61.
PinPoint Toolkit	39.
Infomerge	49.
Key Player	31.
RunRun	31.
Command.Com	39.
Graphics Edge	56.
Pinpoint IIe Upgrade Kit	19.
PinPoint Ram Enhancement	19.
PinPoint Modem Enhancement	19.
ProFILER 3.0	74.
Random House	
*II*Write *(IIe, IIc, IIGS)*	54.
*II*File	54.
Roger Wagner Publishing	
Mouse Write *(IIe, IIc, IIGS)*	89.
Scholastic Talking Text Writer *(IIGS)*	149.
Sensible Software	
Sensible Grammar ProDos *(3.5" & 5.25")*	59.
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PFS: Graph	66.
PFS: File/Report Bundle	66.
PFS: Write w/Speller	66.
Softwood GS File	62.
StyleWare, Inc.	
Multiscribe 3.0 w/Speller *(128K IIe or IIc)*	52.
Multiscribe GS *(Apple IIGS)*	65.
Picture Manager or Desk Accessories	27.
Multiscribe Spell Checker	27.
Multiscribe Fontpaks 1-8 *(each)*	15.
VIP Software	
VIP Professional *(Apple IIc or Enhanced IIe)*	159.
VIP Professional *(IIGS Version)*	179.
Word Perfect Corporation	
WordPerfect V1.1 w/Speller *(IIe & IIc)*	89.
WordPerfect *(Apple IIGS)*	89.

Educational Software

Item	Price
Activision Term Paper Writer	34.
Barron's Computer SAT Revised Version	28.
Baudville Guitar Wizard	19.
Ted Bear Discovers...Rainy Day Games	19.
Broderbund	
Science Tool Kit Master Module	45.
Science Tool Kit Module I or II	26.
Type!	30.
Variable Feasts	35.
Where in the World is Carmen Sandiego?	26.
Where in the USA is Carmen Sandiego?	29.
Davidson & Associates	
Alge-Blaster, Classmate or Math Blaster Plus	29.
Grammar Gremlins or Read 'N' Roll	29.
Homeworker	54.
Speed Reader II	40.
Spell-It or Word Attack!	29.
Math & Me	25.
Designware Grammar Examiner	25.
Remember/SAT Bundle or W.O.R.K. At Home	31.
Spellicopter or Math Maze	25.
States & Traits or Mission Algebra	25.
The Body Transparent	31.
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Mathtalk, Kidtalk, First Shapes, Speller Bee, or Smoothtalker *(IIGS) (each)*	36.
Mathtalk Fractions or First Letters & Words *(IIGS)*	36.
Great Wave Kidstime II *(IIGS)*	29.
Harcourt, Brace, Jovanovich Computer SAT	27.
Hesware Project Space Station	24.
Learning Company Reader Rabbit *(IIGS)*	32.
Think Quick *(IIGS)* or Writer Rabbit	32.
Bumble Plot, Reader Rabbit or Magic Spells	26.
Gertrude's Puzzles or Secrets	30.
Word Spinner	23.
Math Rabbit	26.
Moptown Hotel, Parade, or Number Stumper	26.
Robot Odyssey I or Rocky's Boots	32.
Mindscape Crossword Magic, Drug Alert, or Brainstorms	34.
Perfect Score SAT	48.
Principal's Assistant	42.
Multibotic Robotic Workshop	119.
Peachtree/Eduware Algebra 1, 2, 3, or 4	25.
Algebra 5 & 6	31.
Decimals or Fractions	25.
Compu-Read *(V 3.0)*	18.
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Charlie Brown Typing is a Ball	21.
Garfield Double Dares	21.
Garfield Eat Your Words	21.
Snoopy Writer	21.
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Lovejoy's Preparation for SAT	41.
Speed Reading Tutor IV *(IIe or IIGS Ver.)*	34.
Typing Tutor IV *(IIe, IIc, or IIGS)*	34.
Spinnaker Kindercomp Gold	29.
Homework Helpers Writing or Math *(IIGS)*	32.
Typing Made Easy	32.
Facemaker: Golden Edition	27.
Kidwriter	27.
Kindercomp, Kids on Keys or Alphabet Zoo	21.
Terrapin Enhanced Terrapin Logo V3.0	69.
Weekly Reader	
Stickybear Series: Sticky Bear ABC, Car Builder, Codes & Cyphers, Basic, Drawing, Math I, Math II, Math Word Problems, Music, Music Library, Numbers, Opposites, Parts of Speech, Pic. Builder, Picture Printer Library 1, Printer, Reading, Reading Comprehension, Shapes, Spellgrabber, Typing, Townbuilder, Word Problems or Writer *(each)*	25.

Modems

Item	Price
Anchor Automation	
Signalman Express 1200	185.
Signalman Lightning 2400	299.
Applied Engineering	
DataLink Modem *(300/1200 Baud Internal Modem II+, IIe, IIGS)*	179.
Hayes Hayes Micromodem IIe *(Internal)*	159.
Hayes Smartmodem 1200A *(Internal)*	275.
Hayes 300 Baud Smartmodem IIc w/Smartcom I	189.
Hayes 300 Baud Smartmodem	159.
Hayes 1200 Baud Smartmodem	299.
Hayes 2400 Baud Smartmodem	449.
Prometheus Pro Modem 1200 *(External)*	239.
ProModem 1200G *(Non Expandable)*	169.
Pro Modem 2400 *(External)*	309.
Pro Modem 2400G *(Non Expandable)*	229.
Pro Modem 1200A *(Single Card)*	189.
Pro Modem 300c	89.
Communications Buffer *(2K Exp. to 512K)*	105.
Alphanumeric Display	72.
U.S. Robotics U.S. Robotics Sportster 1200	119.
U.S. Robotics Courier 1200	199.
U.S. Robotics Courier 2400	349.
U.S. Robotics Courier 2400E	409.
U.S. Robotics Courier HST 9600	689.

Accelerators/Ramcards/Z-80/80 Column Cards

Item	Price
Advanced Logic Systems	
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Apple Computer	
Apple IIe Extended 80 Col. Card	89.
Apple IIe Enhancement Kit	49.
Applied Engineering	
RamWorks III *(64K to 3 MB)*	Call
RamWorks Expander 512K or 2M Ver.	Call
2 Meg Plus RamWorks Expander *(1 or 2M)*	Call
RamFactor *(256K to 1MB)*	Call
Z-RAM Ultra 1 *(256K or 512K)*	Call
Z-RAM Ultra 2 or 3 *(256K to 1Meg)*	Call
GS-RAM *(256K to 1.5Meg)*	Call
GS-Ram Plus *(1MB to 6MB)*	Call
Phasor *(II+, IIe, and IIGS)*	139.
TransWarp Accelerator *(II+ and IIe)*	219.
ViewMaster 80 *(II+)*	119.
Z-80 Plus *(II+, IIe, IIGS)*	119.
AST Research	
Ramstack Plus IIGS *(256K Exp. to 1MB)*	105.
MDIdeas, Inc. OctoRam 256k *(8Mb RamCard w/256k Installed)*	129.
OctoRam 1 Meg *(8Mb RamCard w/1 MB Installed)*	279.
OctoRam 2 Meg *(8Mb RamCard w/2 MB Installed)*	479.
OctoRam SIMM Module Upgrade *(256k SIMMs)*	69.
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OctoRam ESP 512K *(Extended Static Ram w/512k)*	299.
OctoRam ESP Upgrade 64k *(64k Static Ram)*	35.
Micro Sci Micro Sci 80/64e	55.
Orange Micro Rampak 4GS *(512k Exp. to 4MB w/Utilities)*	149.

Printer Interface Cards

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Applied Engineering	
Serial Pro *(II+, IIe, IIGS)*	135.
Apricorn Apricord IIc	59.
Super Serial Card	79.
Orange Micro	
Pro Grappler *(Apple IIe or IIGS)*	79.
Serial Grappler Plus	61.
Grappler C/Mac/GS	65.
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Fingerprint IIc *(Specify Internal or External Version)*	79.
Finger Print G+ *(With Parallel Cable II+, IIe, IIGS)*	55.

Clock/Calendar Peripherals

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Applied Engineering TimeMaster H.O.	79.
IIc System Clock	55.
SMT No Slot Clock *(II+ & IIe)*	42.
Thunderware Thunderclock Plus	119.

Accessories

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Kensington System Saver IIGS	69.
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Curtis Emerald	36.
Curtis Ruby	54.
Curtis Sapphire	47.
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A+ ADB Mouse *(IIGS)*	89.
Apple Mouse IIe	125.
Apple Mouse IIc	89.
Thunderscan Apple *(IIGS, IIe, and IIc)*	179.
AST-VisionPlus Digitizer *(IIGS)*	219.
SuperSonic *(Stereo Card for IIGS)*	52.
SuperSonic Digitizer *(IIGS)*	52.
Hayes Mach II Joystick *(Beige or Platinum)*	29.
Hayes Mach III Joystick *(Beige or Platinum)*	37.
Hayes Flight Stick	52.
Kraft Universal 3 Button Joystick *(II+ IIe, IIc)*	34.
Koala Pad Plus w/Graphics Exhibitor	84.
Echo IIB Speech Synthesizer *(II+, IIe, IIGS)*	109.
The Cricket IIc	129.
ImageWriter Ribbon-Black	4.50
ImageWriter Ribbon-Color	5.
ImageWriter II - 4 Color Ribbon	12.
ImageWriter Rainbow Pk. (6 Colors)	27.

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Maxell 5.25" SS/DD *(box of 10)*	10.
3M 5.25" SS/DD *(box of 10)*	11.
3½" Blank Diskettes	
BASF 3.5" DS/DD *(box of 5)*	9.
Bulk *(Sony)* 3½" DS/DD *(box of 10)*	16.
Centech 3½" DS/DD Color Disks *(box of 10)*	19.
Sony 3.5" DS/DD *(box of 10)*	19.
Fuji 3.5" DS/DD *(box of 10)*	20.
Maxell 3.5" DS/DD *(box of 10)*	20.
Verbatim DS/DD *(box of 10)*	20.
3M 3.5" DS/DD *(box of 10)*	21.
C. Itoh 3.5" DS/DD Color Disks *(box of 10)*	25.

Printers

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M-1409 *(180cps Dot Matrix NLQ) 10"*	349.
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HR-20 *(20cps)* Daisywheel	359.
HR-40 *(35cps)* Daisywheel	599.
TwinWriter 5	799.
Epson LX-86/LX-800	Call
FX-86e	Call
FX-286e	Call
LQ-800/1000	Call
EX-800/1000	Call
LQ-2500	Call
(Call For Most Recent Low! Low! Prices)	
Okidata Okimate 20 Color Printer	139.
Microline 182P *(120cps Dot Matrix 10")*	249.
Microline 192*Plus (200cps Dot Matrix 10")*	339.
Microline 193*Plus (200cps Dot Matrix 15")*	489.
Microline 292P *(240cps Dot Matrix 10")*	539.
Microline 293P *(240cps Dot Matrix 15")*	639.
Panasonic	
KXP-1080AP *(100 cps) ImageWriter Compatible*	249.
KXP-10801/M2 *(144 cps)* NLQ Mode	199.
KXP-10911/M2 *(192 cps)* NLQ Mode	209.
KXP-10921 *(240 cps)* NLQ Mode	329.
KXP-1592 *(180 cps)* NLQ Mode	429.
KXP-1595 *(240 cps)* NLQ Mode	469.
KXP-3131 *(17 cps)* Daisywheel	279.
KXP-3151 *(22 cps)* Daisywheel	439.
Star Micronics	
NX-10 *(120cps Dot Matrix/NLQ 10")*	189.
NX-15 *(120cps Dot Matrix/NLQ 15")*	339.
NP-10 *(100cps Dot Matrix/NLQ 10")*	189.

Disk Drives & Hard Disk SubSystems

Item	Price
American Micro Research *(Micro Sci)*	
A5 D Half Height 5¼" Drive *(IIGS)*	149.
A2 Full Height *(II+ & IIe)*	149.
A5 Slimline *(II+ & IIe)*	139.
A5 Slimline IIc	139.
Micro Sci C2 Controller	52.
Central Point Software	
Mix and Match 5¼" & 3½" Drives:	
Universal Disk Controller	79.
Central Point 800KB Drive	185.
Universal Disk Controller/800KB Drive Bundle	259.
First Class Peripherals	
Sider 20MB Hard Drive	549.
Sider 40MB Hard Drive	839.
B-Sider 60MB Tape Backup	839.
Blank Tape 5 Pack	65.
Revision D *(Chip/Software for CP/M)*	52.
Hi-Tech Peripherals	
Full Height 5¼" Drive for Apple IIe *(Beige)*	139.
Half Height 5¼" Drive for Apple IIe or IIc *(Beige)*	139.
Half Height 5¼" Drive for Apple IIe or IIc *(Platinum)*	149.
Half Height 5¼" Drive Platinum for IIGS	169.
Apple IIc Drive Adaptor	15.
Mitac AD-3C Slimline IIc	129.
Pico Products	
Apple Half-Height II+, IIe, IIc	139.
ProAPP ProAPP 20 MB Hard Disk System *(II+, IIe, & IIc)*	799.
Video Technology Computers, Inc.	
Laser FD 100c *(Apple IIc)*	139.
Laser FD 100 *(Apple II Series)*	139.

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COVER FEATURE

by Rudy A. Guy

MESSAGE CENTER

Improve communications in your busy home or office! Use this program to create and display important announcements.

Even if you don't have a modem, you've probably heard of computer bulletin board systems (BBS's), which allow users to leave messages for others, both privately and publicly. And if you *have* used a BBS, you know how convenient this form of communication can be.

Here's Message Center, which uses similar methods to let you keep the rest of your household up-to-date on the family's activities. You can leave messages to individuals or to everyone who uses the program. When run under ProDOS 8 (version 1.2 or greater), Message Center will access any ProDOS-compatible clock card or chip. This allows you, or your Apple, to select public messages which will be displayed at certain times on certain dates. Up to 100 messages may be stored and displayed in the message database.

Message Center is written in Applesoft, and will only operate under ProDOS on an Apple IIc, IIGS, or IIe equipped with at least 128K. It's an updated and expanded version of a five-year-old program called Electronic Message Center, originally published in *Nibble* (Vol. 3/No. 7).

USING THE PROGRAM

The first time that Message Center is run, all of the necessary files will be created on your disk. Since the message database files can use a lot of disk space, you should create a ProDOS disk with the following files:

1. PRODOS (Version 1.2 or greater)
2. BASIC.SYSTEM
3. STARTUP
4. MESSAGE.CENTER

The STARTUP file can be a simple one-line program like the following:

```
1Ø PRINT CHR$(4)"-MESSAGE.CENTER"
```

Rudy A. Guy, 1319 W. 10th St., Erie, PA 16502. Message Center runs only under ProDOS and requires an Apple IIc, Apple IIGS, or an Apple IIe with 128K.

After you have keyed in this line, save it to your disk as STARTUP. When your disk is booted, ProDOS will load and execute BASIC.SYSTEM. BASIC.SYSTEM then looks for a file called STARTUP. Your one-line program will be executed and it, in turn, will load and run Message Center.

From the main program menu, you will have the options shown in **Figure 1**. To select the appropriate option, you may use the Up, Down, Left- or Right-Arrow keys or the number keys (1-7) followed by the Return key. Selecting any option other than 1 or 7 the first time you run the program will cause a message to be displayed telling you that there are no messages in the database. So, it's best to begin at the top and then select option one to add messages.

Messages in Message Center are limited to a length of 480 characters. When the add-messages option is selected, an input window will be displayed in the center of your screen. You should type your

FIGURE 1: Main Menu

```
              * Message Center *
               By Rudy A. Guy
     Copyright (c) 1988 By MicroSPARC, Inc.
==================================================

                  Main Menu

         1. Add Message to Message.Base
         2. Delete Messages from Message.Base
         3. Prepare Display Sequence
         4. Display Messages
         5. Display Personal Messages
         6. Edit a Message
         7. Return to BASIC
```

message just as you would on your word processor. The Left-Arrow key and the Delete key are destructive backspace keys. This means that when these keys are pressed, the character preceding the cursor will be erased. The Right-Arrow key acts the same as the Space bar. The only character that cannot be entered into a message is a double quote mark. If you enter a double quote, the program will convert it to a single quote mark before printing it on the screen. If you change your mind about adding a message to the database, press the Escape key and you will be returned to the main menu.

Because MESSAGE.CENTER has its own word-wrap routine, there is no need to press the Return key when the end of a line of text is reached. If your message is only two or three lines long, simply press the Return key until you see the question "Is this information correct?" If you enter N or n at this prompt, you will be able to edit your message, and an arrow will appear to the left of the text that you entered. Using either the arrows or the appropriate number keys in conjunction with the Return key, select the line to be changed. To change a line, you must retype it in the small edit window that will appear in the lower portion of the screen. If, after you have selected a line to edit, you change your mind, press the Escape key, Control-X, or the Clear key on the IIGS, and the original line will be restored. To exit the Edit mode, press the Escape key again.

After you've entered your message, you will be prompted to enter a topic. This field will allow an input of up to 25 characters. Next, you must decide if the message is for the public or the private message area. If it is to be placed in the public area, press the Return key to accept the default value, "ALL". If you decide to send it to an individual, enter his or her name at this prompt. Your input for this field is limited to 18 characters.

If your system is equipped with a clock card or IIGS clock chip, you will next be asked to enter the starting date, ending date, starting time, and ending time for each message. For example, let's suppose that we entered the following data for the date and time entries:

```
Starting date:06/15/88
Ending date:  06/18/88
Starting time:09:00
Ending time:  23:00
```

The message that we entered into the message database will be displayed from 9 A.M. through 11 P.M. on June 15, 1988 through June 18, 1988. All time entries are entered as Military Time (using a 24-hour clock). If you want the message to be displayed all of the time, press the Return key when prompted for the beginning and ending dates and times.

Deleting Messages

From time to time, you'll need to delete messages from the database. When option two is selected from the main menu, a warning will be displayed to advise you that if any files are deleted, the current DISPLAY.LIST file will also be deleted. If you decide to continue, a listing of all pertinent information about the files will be displayed. Using the arrow keys, you may select the files to be deleted from the message database. When the number of the file to be deleted is shown in inverse, press the Return key. To confirm that you really want to delete the file, you must press the Delete key. Any other key will cancel the deletion of the file. If there are more than 17 messages in the database, pressing the Tab key will bring up the next 17 messages. The Open-Apple-Tab sequence will redisplay the prior messages. When you have finished deleting files, press either the Escape key or the Q key. If any messages have been deleted, the message database will be purged before you are returned to the main program menu.

Creating A Display List

Option three will allow you to create a custom display list for the public message area. As in the delete message area, the message topics will be displayed to the screen in groups of 17. Use the arrow keys to select the messages to be included in the display list and then press the Return key. Personal files may not be entered into a custom display list. As each file is selected, a running total of files will be kept in the lower-right corner of the screen and the selected files will be displayed in inverse. To deselect a message, move the cursor to the number preceding the desired message and press Return. The message will be reprinted in normal text and the number of selected topics will be decreased by one. As in the delete message area, the Tab and Open-Apple-Tab sequences may be used to go forward and backward through the message database.

When you have selected all of the messages for the the display list, press the Q key. Your custom display list will be written to the disk and you will be returned to the main menu. If, after selecting this option, you decide that you do not want to create a display list, press the Escape key and the option will be canceled.

TABLE 1: Program Logic

Lines	Function
90 - 520	Main input routine for entering messages - includes word-wrap routine
530 - 840	Input routine used when editing a message
870 - 890	Check for IIe, IIc, or IIGS w/extended 80-column card
900 - 930	Check for the MESSAGE.BASE file and the existence of /RAM
960	Check for clock card or chip
970 - 1060	Main menu
1070 - 1270	Main menu option selection using number keys and arrows
1280 - 2380	Add messages to the message database
1400 - 1620	Select and edit line of text
1680 - 1740	Get TOPIC and address for message
1750 - 2160	Input routines for dates and times of message
2230 - 2250	Write message to MESSAGE.BASE
2290 - 2370	Subroutine to check Time & Date entries
2390 - 2610	Delete messages from MESSAGE.BASE
2490 - 2570	Display message topics for deletion process
2620 - 2910	Create a DISPLAY.LIST file
2690 - 2780	Display message topics for addition to DISPLAY.LIST
2870 - 2910	Write information to DISPLAY.LIST file
2920 - 3620	Display public messages
2940 - 2970	Determine if DISPLAY.LIST file exists
2990 - 3200	Create a display list if the DISPLAY.LIST file does not exist
3100 - 3200	Display messages
3310 - 3470	Subroutine to set windows for message display
3480 - 3510	Move messages from disk to /RAM
3520 - 3840	Display private messages
3850 - 4290	Purge deleted messages from the message database
3890 - 3950	Determine size of MESSAGE.BASE and space left on the disk
3960 - 4080	Purge deleted messages using program disk
4090 - 4290	Purge deleted messages using /RAM - not enough space to use program disk for purge
4300 - 4310	Display message that MESSAGE.BASE is empty
4320 - 4810	Edit an existing message in MESSAGE.BASE
4820 - 4880	Exit program - reset PREFIX
4890 - 4980	Read TOPICS from MESSAGE.BASE
4990 - 5220	Subroutine to move cursor in Delete, Display List, and Edit portion of the program
5230 - 5340	Delete message from MESSAGE.BASE
5350 - 5420	Select message for DISPLAY.LIST
5430 - 5460	Select message from MESSAGE.BASE for editing
5540 - 5580	Subroutine to display date & time
5630 - 5680	Get time and date via MLI
5700 - 5710	Center text routine
5720 - 5890	Error handling routine - includes initialization of files on first run of the program
5900 - 5910	Adjust the edit display except on an unenhanced IIe

Display Public Messages

To display messages in the public message area, select option four from the program menu. If you have created a custom display list, the appropriate files will be loaded for display. If there is no display list on the disk, the computer will create one. Each of the messages in the database will be scanned for their starting and ending dates. Personal messages will again be ignored in the selection process. After all of the messages have been selected, Message Center will begin displaying the messages as shown in **Figure 2** within their proper time frame.

Let's suppose that there are four messages in the message base and all of them have a starting time of 0900 hours and an ending time of 1000 hours. If we begin the display process at 0910, all four files will be displayed until 1000 hours. At that point, the program will automatically revert to the main program menu. However, if these four files had been entered as a custom display list, when 10 o'clock arrived, the display list would be deleted before the program would return to the main menu.

The length of time that each message is displayed is based on the type of computer in use. If you use the program on an Apple IIGS in fast mode, the messages will change approximately every 15 seconds. In slow mode on the IIGS and on other Apple II's, the message changes about every 45 seconds. You may jump through the messages at a faster pace by pressing the Tab key.

If your computer is not equipped with a time clock, or if your messages are stored with zeros in the various time and date options, the message will be displayed until the Escape key is pressed. If the messages being displayed when the Escape key is pressed came from a custom display list, you will be asked if you want to delete the current display list before you are returned to the menu portion of the program.

Display Personal Messages

When you select option five from the program menu, you enter the personal message area. It works in virtually the same manner as the public message area. All messages are displayed based on their time windows. The only difference in this area is that the user must enter his or her name before the appropriate message will be loaded. If this program is used in a school classroom setting, class names could be used in the place of individual names. To exit the personal message area, press the Escape key.

Edit a Message

Option six allows you to edit an existing message in the message database. As in the create display list and delete message options, the information on the messages will be displayed, 17 at a time. To choose the message you want to edit, use the arrow keys to move the inverse cursor to the correct file. When you press the Return key, the message will be read and displayed to the screen. This editing function works the same as the edit function in the add message portion of the program. When a file is edited using this option, you must again enter the topic, whether it's a public or personal message, and the starting and ending dates and times.

ENTERING THE PROGRAM

To enter the program, simply type in **Listing 1** and save it with the following command:

SAVE MESSAGE.CENTER

PROGRAM LOGIC

Since Message Center is a ProDOS-based program, I decided to take advantage of some of the powerful features that ProDOS has to offer. In its predecessor, E.M.C., the messages were stored in a sequential text file and then loaded into an array for displaying. The program worked, but loading all of the messages into memory took a large chunk out of the Apple II's 48K. The new Message Center uses the ProDOS RAM disk when messages are being displayed. The appropriate messages are read from the file

FIGURE 2: Message Display

```
ESC to Quit         *** Message Center ***        04/23/88 14:23
TAB for Next Message
================================================================

              Advanced Message Center
                  By Rudy A. Guy
        (c) Copyright 1988, MicroSPARC, Inc.
                Concord, MA 01742

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      Erie, PA 16507
```

MESSAGE.BASE and are then copied into a file named MSG on the RAM disk. Each time a message is needed, it is read from the RAM disk, thus alleviating the need for a large 100-element display array.

Earlier in the article I mentioned that the maximum number of messages that could be stored was 100. The reason for this limit is that 100 messages take up 115 blocks on a ProDOS disk. The RAM disk (/RAM) has a 119-block capacity. So, if 100 messages are stored on disk, and all 100 are selected for display, they will all fit on the 64K RAM disk with four blocks to spare.

Likewise, when deleted files are being purged from the message database, and there is not enough room on the data disk to write a temporary file, the RAM disk is used as a work disk. If more than 100 messages were allowed, the message database would be too large to be handled by /RAM.

The purge portion of the delete a message function is another area where ProDOS' capabilities make the job easier for the programmer. Under DOS 3.3, you had to be an assembly language genius to read the disk directory. Using ProDOS, all that you need to understand is how to read a text file and manipulate strings. The routine that starts at **line 3890** finds the size, in blocks, of the file MESSAGE. BASE. Next, the routine checks for the existence of a DISPLAY.LIST file. If this file is found, the value of FL is set to True. **Line 3930** checks to see how many blocks remain available on the current disk for the purge function. If the size of the MESSAGE. BASE file exceeds the number of free blocks, then the computer makes the decision to use the RAM disk rather than the program disk (**line 3950**).

ProDOS also allows easy access to a clock card or clock chip. When ProDOS is booted, a check is made throughout the system for a clock card. If a clock is located in the system, a call to the MLI (Machine Language Interface) GET_TIME function will return either the value of zero in location $BF90-$BF93 or the current date and time. The routine that begins at **line 5640** sets up the jump to the MLI along with the appropriate function code. **Lines 5650-5670** then extract the date and time for use by the program. The first time this routine is called, if zeros are found for the date and time, then the flag CL is set to zero — no clock.

All of the major routines in Message Center have REM statements, but **Table 1** describes the program logic in greater detail.

MODIFICATIONS

Programmers say that when a program has no bugs and no needed modifications, then it is probably obsolete. To keep the program from becoming obsolete, you may want to consider adding multiple message database files or multiple custom display lists. How about a hard copy listing of the messages? Control-G's for important messages? The list could go on and on. So, do your best to keep Message Center from obsolescence. . .enhance!

THE **JANUARY 1988 DISK** CONTAINS THIS PROGRAM

If you'd rather not type in the listing for this program, you can buy it on disk, complete, free of typos and ready to run. *Nibble*'s January 1988 programs are available on a single disk for an introductory price of $12.95 from *Nibble*, 52 Domino Dr., Concord, MA 01742. Add $2.50 for shipping/handling within the U.S. and Canada; $7.50 for overseas air mail. Introductory price expires 3/31/88; after that date, the price will be $16.95. See the coupon on the last page of the Nibble Software Catalog for ordering information. **ORDER NO.: W03**

LISTING 1: MESSAGE.CENTER

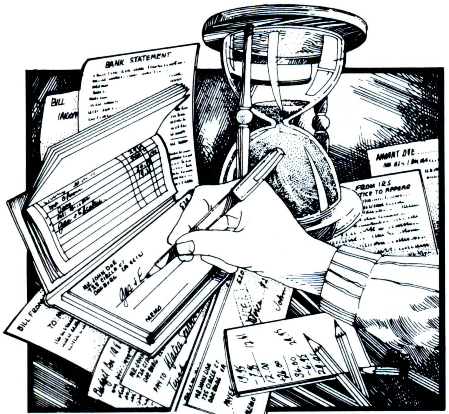
```
10  REM ::::::::::::::::::::::::::::
20  REM ::      MESSAGE CENTER      ::
30  REM ::      BY RUDY A. GUY      ::
40  REM ::  COPYRIGHT (C)  1988     ::
50  REM ::  BY MICROSPARC,  INC     ::
60  REM ::  CONCORD,  MA  01742     ::
70  REM ::::::::::::::::::::::::::::
80  GOTO 860
90  REM  MAIN INPUT ROUTINE
100 L = 60: FOR I = 1 TO 8:M$(I) = "": NEXT
110  VTAB 9: POKE 1403,9: INVERSE : FOR I = 1
      TO 62: PRINT " ";: NEXT : PRINT : REM 1
      SPACE
120  FOR I = 1 TO 8: POKE 1403,9: PRINT " ";:
      POKE 1403,70: PRINT " ";: NEXT : REM 1
     SPACE
130  POKE 1403,9: FOR I = 1 TO 62: PRINT " ";
     : NEXT : NORMAL : REM 1 SPACE
140  POKE 32,10: POKE 33,60: POKE 34,9: POKE
     35,17: HOME
150  FOR I = 1 TO 420: PRINT "_";: NEXT : VTAB
     9: POKE 1403,10: PRINT
160 V = 10: FOR I = 1 TO 8:M$ = "": IF I = 8 THEN
      POKE 33,62
170 P = 0:FL = 0: IF  PEEK (64448) = 234 THEN
      POKE 32,5
180  IF FL THEN  NORMAL : VTAB V: POKE 1403,P
     : PRINT " ";: GOTO 200
190  INVERSE : VTAB V: POKE 1403,P: PRINT " "
     ;: NORMAL
200 X =  PEEK ( - 16384): IF X > 127 THEN  POKE
      - 16368,0: GOTO 220
210 FL =  ABS (FL - 1): GOTO 180
220  IF X = 149 THEN X = 160: GOTO 290
230  IF X = 136 OR X = 255 THEN 320
240  IF X = 141 THEN 390
250  IF X = 155 THEN  RETURN
260  IF X = 162 THEN X = 167
270  IF X < 156 THEN 180
280  IF F2 AND M$ <  >  CHR$ (160) THEN  GOSUB
     430
290 M$ = M$ +  CHR$ (X): VTAB V: POKE 1403,P:
      PRINT  CHR$ (X);: IF P = 59 AND I = 8 THEN
      INVERSE : PRINT " ";: NORMAL : POKE 33,
     60
300  IF P < 59 THEN P = P + 1: GOTO 180
310  IF P = 59 THEN V = V + 1:P = 0:M$(I) = M
     $:F2 = 1: GOTO 410
320  IF P = 0 AND I = 1 THEN 180
330  IF P = 0 THEN M$(I) = "": VTAB V: POKE 1
     403,P: PRINT "_";:I = I - 1:V = V - 1: VTAB
     V: PRINT :P =  LEN (M$(I)):M$ = M$(I): IF
     P <  > 60 THEN 180
340  IF P = 60 THEN P = 59:M$ =  LEFT$ (M$,59
     ): GOTO 180
350  IF I < 8 THEN  VTAB V: POKE 1403,P: PRINT
     "_";:P = P - 1: VTAB V: POKE 1403,P: PRINT
     " ";: GOTO 370
360  VTAB V: POKE 1403,P: PRINT " ";:P = P -
     1: POKE 1403,P: PRINT " ";
370  IF P = 0 THEN M$ = "": GOTO 180
380 M$ =  LEFT$ (M$,P): GOTO 180
390 M$(I) = M$: IF I = 8 THEN  POKE 33,60: VTAB
     V: POKE 1403,P: PRINT " ";: GOTO 420
400  POKE 1403,P: POKE 33,60: PRINT "_":V = V
      + 1
410  IF F2 AND  RIGHT$ (M$(I),1) =  CHR$ (160
     ) THEN F2 = 0
420  NEXT : RETURN
430 L = 59
440  IF  MID$ (M$(I - 1),L,1) =  CHR$ (160) THEN
     T$ =  RIGHT$ (M$(I - 1),60 - L):M$(I - 1
     ) =  LEFT$ (M$(I - 1),L): GOTO 480
450 L = L - 1
460  IF L = 0 THEN F2 = 0: RETURN
470  GOTO 440
480 M$ = T$ + M$: IF I = 8 THEN  POKE 33,60
490  VTAB V - 1: POKE 1403,0: CALL  - 868: VTAB
     V - 1: PRINT M$(I - 1)
500  VTAB V: POKE 1403,0: PRINT M$;:P =  LEN
     (M$):F2 = 0
510  IF I = 8 THEN  POKE 33,62
520  RETURN
530  REM INPUT ROUTINE FOR CHANGES
540 L = 60: POKE  - 16368,0
550  VTAB 20: POKE 1403,9: INVERSE : FOR J =
     1 TO 62: PRINT " ";: NEXT : PRINT : REM
      1 SPACE
560  VTAB 22: POKE 1403,9: INVERSE : FOR J =
     1 TO 62: PRINT " ";: NEXT : REM  1 SPACE
570  VTAB 21: POKE 1403,8: NORMAL
580  POKE 32,10 - (( PEEK (64448) = 234) * 5)
     : POKE 33,60: POKE 34,20: POKE 35,21: HOME
     : POKE 33,61
590 V = 21:P = 0:FL = 0:M$ = ""
600  IF FL THEN  NORMAL : VTAB V: POKE 1403,P
     : PRINT " ";: GOTO 620
610  INVERSE : VTAB V: POKE 1403,P: PRINT " "
     ;: NORMAL
620 X =  PEEK ( - 16384): IF X > 127 THEN  POKE
      - 16368,0: GOTO 640
630 FL =  ABS (FL - 1): GOTO 600
640  IF X = 149 THEN X = 160: GOTO 710
650  IF X = 136 OR X = 255 THEN 740
660  IF X = 141 THEN 790
670  IF X = 152 THEN  POKE  - 16360,0: VTAB V
     T: POKE 1403,0: CALL  - 868: VTAB VT: POKE
     1403,0: GOTO 800
680  IF X = 155 THEN 830
690  IF X = 162 THEN X = 167
700  IF X < 156 THEN 600
710 M$ = M$ +  CHR$ (X): VTAB V: POKE 1403,P:
      PRINT  CHR$ (X);: IF P = 59 THEN  INVERSE
     : PRINT " ";: NORMAL : POKE 33,60
720  IF P < 59 THEN P = P + 1: GOTO 600
730  IF P = 59 THEN 790
740  IF P = 0 THEN 600
750  IF P = 60 THEN P = 59:M$ =  LEFT$ (M$,59
     ): GOTO 600
760  VTAB V: POKE 1403,P: PRINT " ";:P = P -
     1: VTAB V: POKE 1403,P: PRINT " ";: REM
     1 SPACE
770  IF P = 0 THEN M$ = "": GOTO 600
780 M$ =  LEFT$ (M$,P): GOTO 600
790 M$(I) = M$: VTAB VT: POKE 1403,0: CALL  -
     868: VTAB VT: POKE 1403,0
800  IF  LEN (M$(I)) = 60 THEN  POKE 33,62: PRINT
     M$(I);: INVERSE : PRINT " ";: NORMAL : POKE
     33,60: GOTO 830
810  IF ED THEN  PRINT M$(I);: FOR J =  LEN (
     M$(I)) + 1 TO 60: PRINT " ";: NEXT : GOSUB
     5900: GOTO 830: REM 1 SPACE
820  PRINT M$(I);: FOR J =  LEN (M$(I)) + 1 TO
     60: PRINT "_";: NEXT : INVERSE : PRINT "
      ";: NORMAL
830  TEXT : VTAB 20: POKE 1403,1: CALL  - 958
840 I = 1: RETURN
850  REM  PROGRAM STARTS HERE
860 D$ =  CHR$ (4):Q$ =  CHR$ (34): DIM DS(10
     0),T$(100)
870  IF  PEEK (64435) <  > 6 THEN 5690: REM C
     HECK FOR //E, IIC OR GS
880  IF  PEEK (64435) = 6 AND  PEEK (64448) =
     244 THEN GS = 1
890  HOME : POKE 49153,0: POKE 49237,0: POKE
     1024,123:F8 =  PEEK (1024) <  > 123: POKE
     49236,0: POKE 49152,0: IF F8 GOTO 5690: REM
     CHECK FOR 80 COLUMN CARD
900  ONERR  GOTO 5730
910  PRINT D$"PREFIX": INPUT PR$
920 CH = 1: PRINT D$"VERIFY /RAM"
930 CH = 2: PRINT D$"VERIFY MESSAGE.BASE":CH =
     0
940  PRINT D$"OPEN MESSAGE.BASE,L575": PRINT
     D$"READ MESSAGE.BASE,R0": INPUT NU: PRINT
     D$"CLOSE"
950  PRINT D$"PREFIX": INPUT PF$
960  GOSUB 5640:CL = 1: IF HR$ = "00" AND DA$
      = "00" AND MN$ = "00" AND MI$ = "00" THEN
     CL = 0
```

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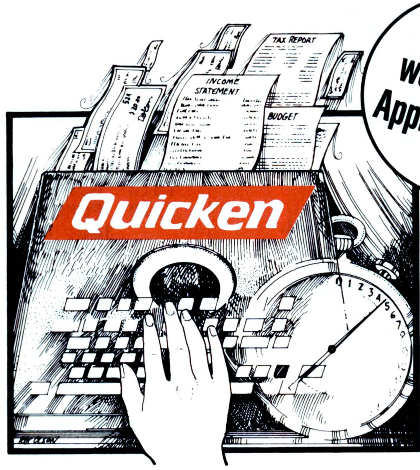
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LISTING 1: MESSAGE CENTER *(continued)*

```
970  PRINT D$"PR#3": PRINT :A$ = "* Message C
     enter *": GOSUB 5710
980 A$ = "By Rudy A. Guy": GOSUB 5710:A$ = "C
     opyright (c) 1988 By MicroSparc, Inc.": GOSUB
     5710: GOSUB 5520
990  VTAB 7:A$ = "Main Menu": GOSUB 5710
1000  FOR I = 1 TO 7: READ A$(I): NEXT
1010  DATA  "1. Add Messages to Message.Base"
     ,"2. Delete Messages from Message.Base",
     "3. Prepare Display Sequence","4. Displa
     y Messages"
1020  DATA   "5. Display Personal Messages","
     6. Edit a Message","7. Return to BASIC"
1030  VTAB 9: FOR I = 1 TO 7: POKE 1403,25: PRINT
     A$(I): PRINT : NEXT
1040  GOSUB 5570: POKE  - 16368,0
1050 VT = 9:HT = 25:I = 1:T = 49:FL = 0
1060  GOSUB 2380: INVERSE : PRINT A$(I): NORMAL

1070 X =  PEEK ( - 16384):T = T + 1
1080  IF X = 138 OR X = 149 THEN  GOSUB 1150:
      GOTO 1120
1090  IF X = 136 OR X = 139 THEN  GOSUB 1180:
      GOTO 1120
1100  IF X > 176 AND X < 184 THEN X = X - 176
     : GOSUB 1210: GOTO 1120
1110  IF X = 141 THEN 1240
1120  IF CL AND T = 50 THEN  GOSUB 5550:T = 0
1130  GOTO 1070
1140  REM  HANDLE DOWN ARROW
1150  POKE  - 16368,0: IF I = 7 THEN  GOSUB 2
     380: PRINT A$(I):I = 1:VT = 9: INVERSE :
      GOSUB 2380: PRINT A$(I): NORMAL : RETURN

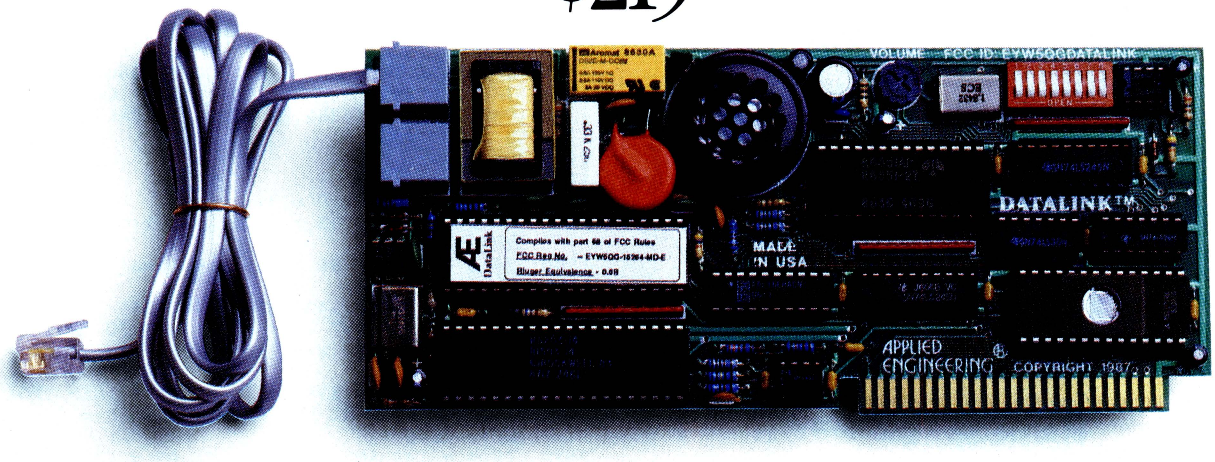
1160  GOSUB 2380: PRINT A$(I):I = I + 1:VT =
     VT + 2: INVERSE : GOSUB 2380: PRINT A$(I
     ): NORMAL : RETURN
1170  REM  HANDLE UP ARROW
1180  POKE  - 16368,0: IF I = 1 THEN  GOSUB 2
     380: PRINT A$(I):I = 7:VT = 21: INVERSE
     : GOSUB 2380: PRINT A$(I): NORMAL : RETURN

1190  GOSUB 2380: PRINT A$(I):I = I - 1:VT =
     VT - 2: INVERSE : GOSUB 2380: PRINT A$(I
     ): NORMAL : RETURN
1200  REM  HANDLE KEY PRESS
1210  POKE  - 16368,0: GOSUB 2380: PRINT A$(I
     ):I = X:VT = 7 + (X * 2): INVERSE : GOSUB
     2380: PRINT A$(I): NORMAL
1220  RETURN
1230  REM  HANDLE A RETURN
1240  POKE  - 16368,0: IF I = 2 THEN SL = 1
1250  ON I GOSUB 1290,2410,2630,2930,3640,432
     0,4830
1260  IF SL = 1 AND DE = 1 THEN SL = 0:DE = 0
     : GOSUB 3860: REM DO A PURGE IF A FILE H
     AS BEEN DELETED.
1270 ED = 0:R = 0: RESTORE : GOTO 970
1280  REM   ADD MESSAGE TO MESSAGE.BASE
1290 A$ = "ADD MESSAGES": GOSUB 5500
1300  IF NU = 100 THEN  VTAB 12: PRINT  CHR$
     (7)"Message.base is full.": PRINT : PRINT
     "Press a key for the menu.";: GET A$: PRINT
     A$: RETURN
1310  GOSUB 100: IF X = 155 THEN  TEXT : HOME
     : RETURN
1320  TEXT : VTAB 1: POKE 1403,0: PRINT "
                        ";: REM  23 spaces
1330  POKE 34,19: HOME
1340  VTAB 21: POKE 1403,20: PRINT "'A' to ca
     ncel message.": VTAB 20: POKE 1403,20: POKE
      - 16368,0: INPUT "Is this message corre
     ct?";YN$: TEXT
1350  IF  LEFT$ (YN$,1) = "Y" OR  LEFT$ (YN$,
     1) = "y" THEN 1660
1360  IF  LEFT$ (YN$,1) = "N" OR  LEFT$ (YN$,
     1) = "n" THEN  VTAB 20: CALL  - 958: GOTO
     1400
1370  IF ED = 1 AND ( LEFT$ (YN$,1) = "A" OR
      LEFT$ (YN$,1) = "a") THEN  POP : RETURN

1380  IF  LEFT$ (YN$,1) = "A" OR  LEFT$ (YN$,
     1) = "a" THEN  RETURN
1390  VTAB 20: CALL  - 958: PRINT  CHR$ (7): GOTO
     1340
1400  INVERSE : VTAB 10: FOR I = 1 TO 8: POKE
     1403,8: PRINT I: NEXT : NORMAL
1410  VTAB 20: CALL  - 868:VT = 10:HT = 5:I =
     1:A$ = "-->":B$ = "   ":T = 49: REM   B$
      = 3 spaces
1420  VTAB 1: POKE 1403,0: PRINT "ESC to exit
      edit mode";: GOSUB 5570
1430  GOSUB 2380: PRINT A$;
1440 X =  PEEK ( - 16384):T = T + 1
1450  IF X = 155 THEN 1630
1460  IF X = 138 OR X = 149 THEN  GOSUB 1520:
     GOTO 1500
1470  IF X = 136 OR X = 139 THEN  GOSUB 1540:
     GOTO 1500
1480  IF X > 176 AND X < 185 THEN X = X - 176
     : GOSUB 1560: GOTO 1500
1490  IF X = 141 THEN 1580
1500  IF CL AND T = 50 THEN  GOSUB 5550:T = 0
1510  GOTO 1440
1520  POKE  - 16368,0: IF I = 8 THEN  GOSUB 2
     380: PRINT B$;:I = 1:VT = 10: GOSUB 2380
     : PRINT A$;: RETURN
1530  GOSUB 2380: PRINT B$;:I = I + 1:VT = VT
      + 1: GOSUB 2380: PRINT A$;: RETURN
1540  POKE  - 16368,0: IF I = 1 THEN  GOSUB 2
     380: PRINT B$;:I = 8:VT = 17: GOSUB 2380
     : PRINT A$;: RETURN
1550  GOSUB 2380: PRINT B$;:I = I - 1:VT = VT
      - 1: GOSUB 2380: PRINT A$;: RETURN
1560  POKE  - 16368,0: GOSUB 2380: PRINT B$;:
     I = X:VT = 9 + X: GOSUB 2380: PRINT A$;
1570  RETURN
1580  POKE  - 16368,0: VTAB 24: POKE 1403,0: PRINT
     "Please enter new text and press RETURN.
     ";: CALL  - 868
1590  VTAB 1: POKE 1403,0: PRINT "ESC to rest
     ore original line";
1600  GOSUB 540
1610  VTAB 1: POKE 1403,0: PRINT "ESC to exit
      edit mode       ";: REM   7 spaces
1620  FOR I = 1 TO 8:VT = I + 9: GOSUB 2380: PRINT
     B$;: NEXT : GOSUB 5570: GOTO 1400
1630  POKE  - 16368,0: GOSUB 2380: PRINT B$;
1640  INVERSE : VTAB 10: FOR I = 1 TO 8: POKE
     1403,8: PRINT I: NEXT : NORMAL
1650  GOTO 1320
1660  TEXT : POKE 34,2: VTAB 20: CALL  - 958
1670  FOR J = 1 TO 8: PRINT : NEXT
1680  VTAB 16: POKE 1403,20: PRINT "Topic:";:
      FOR J = 1 TO 25: PRINT "_";: NEXT
1690  VTAB 16: POKE 1403,26: INPUT "";T$
1700  IF  LEN (T$) < 1 OR  LEN (T$) > 25 THEN
      PRINT  CHR$ (7): VTAB 16: CALL  - 958: GOTO
     1680
1710  VTAB 17: POKE 1403,20: PRINT "To:ALL";:
      FOR I = 1 TO 17: PRINT "_";: NEXT
1720  VTAB 17: POKE 1403,23: INPUT "";TW$
1730  IF  LEN (TW$) > 20 THEN  PRINT  CHR$ (7
     ): VTAB 17: CALL  - 958: GOTO 1710
1740  IF TW$ = "" THEN  VTAB 17: POKE 1403,23
     : PRINT "ALL":TW$ = "ALL"
1750  IF  NOT CL THEN SD$ = "000000":ED$ = SD
     $:ST$ = "0000":ET$ = ST$: IF ED THEN  RETURN

1760  IF  NOT CL THEN 2170
1770  FOR J = 1 TO 2
1780  IF J = 1 THEN B$ = "Starting date:__/__
     /__":VT = 18
1790  IF J = 2 THEN B$ = "Ending date:  __/__
     /__":VT = 19
1800  VTAB VT: POKE 1403,20: PRINT B$ + " Use
      the form MM/DD/YY"
1810 P = 34:A$ = "": VTAB VT + 2: POKE 1403,2
     0: PRINT "ESC to restart date entry, RET
     URN to accept"
1820 X =  PEEK ( - 16384): IF X = 155 THEN  POKE
      - 16368,0: VTAB VT: CALL  - 958: GOTO 1
     800
1830  IF X = 141 AND P = 34 THEN A$ = "000000
     ": POKE  - 16368,0: VTAB VT: POKE 1403,P
     : PRINT "00/00/00": GOTO 1920
1840  IF X < 176 OR X > 185 THEN 1820
1850  POKE  - 16368,0: VTAB VT: POKE 1403,P: PRINT
      CHR$ (X);
1860 A$ = A$ +  CHR$ (X - 128)
1870 P = P + 1: IF P = 36 OR P = 39 THEN P =
     P + 1
```

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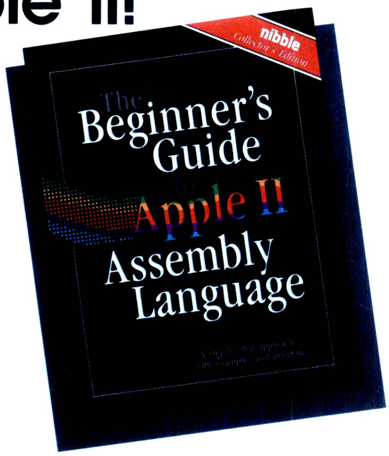
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LISTING 1: MESSAGE CENTER *(continued)*

```
1880  IF P = 42 THEN 1900
1890  GOTO 1820
1900 X =  PEEK ( - 16384): IF X = 155 THEN  POKE
      - 16368,0: VTAB VT: CALL  - 958: GOTO 1
     800
1910  IF X <  > 141 THEN 1900
1920  POKE  - 16368,0: VTAB VT + 1: CALL  - 9
     58: GOSUB 2290: IF FL THEN FL = 0: POKE
      - 16368,0: VTAB VT: CALL  - 958: GOTO 1
     800
1930  IF J = 1 THEN SD$ = A$: GOTO 1960
1940  IF  VAL (A$) <  VAL (SD$) THEN  CALL  -
     198: POKE  - 16368,0: VTAB VT: CALL  - 9
     58: GOTO 1800
1950 ED$ = A$
1960  NEXT
1970  FOR J = 1 TO 2:P = 34
1980  IF J = 1 THEN B$ = "Starting time:__:__
     ":VT = 20
1990  IF J = 2 THEN B$ = "Ending time:  __:__
     ":VT = 21
2000  VTAB VT: POKE 1403,20: PRINT B$
2010 A$ = "": VTAB VT + 2: POKE 1403,20: PRINT
     "ESC to restart time entry, RETURN to ac
     cept"
2020 X =  PEEK ( - 16384): IF X = 155 THEN  POKE
      - 16368,0: VTAB VT: CALL  - 958:P = 34:
      GOTO 2000
2030  IF X = 141 AND P = 34 THEN A$ = "0000":
      POKE  - 16368,0: VTAB VT: POKE 1403,P: PRINT
     "00:00": GOTO 2120
2040  IF X < 176 OR X > 185 THEN 2020
2050  POKE  - 16368,0: VTAB VT: POKE 1403,P: PRINT
      CHR$ (X);
2060 A$ = A$ +  CHR$ (X - 128)
2070 P = P + 1: IF P = 36 THEN P = P + 1
2080  IF P = 39 THEN 2100
2090  GOTO 2020
2100 X =  PEEK ( - 16384): IF X = 155 THEN  POKE
      - 16368,0: VTAB VT: CALL  - 958:P = 34:
      GOTO 2000
2110  IF X <  > 141 THEN 2100
2120  POKE  - 16368,0: VTAB VT + 1: CALL  - 9
     58: GOSUB 2350: IF FL THEN FL = 0: POKE
      - 16368,0: VTAB VT: CALL  - 958:P = 34:
      GOTO 2000
2130  IF J = 1 THEN ST$ = A$: GOTO 2150
2140  IF SD$ = ED$ AND  VAL (ST$) >  VAL (A$)
      THEN  CALL  - 198: VTAB VT: CALL  - 958
     :P = 34: GOTO 2000
2150 ET$ = A$
2160  NEXT : IF ED THEN  RETURN
2170  PRINT : POKE 1403,20: PRINT "Is this in
     formation correct? (Y/N/ESC to cancel) "
     ;
2180 X =  PEEK ( - 16384)
2190  IF X = 155 THEN  POKE  - 16368,0: RETURN

2200  IF X = 217 OR X = 249 THEN  POKE  - 163
     68,0: GOTO 2230
2210  IF X = 206 OR X = 238 THEN  POKE  - 163
     68,0: VTAB 16: CALL  - 958: GOTO 1680
2220  GOTO 2180
2230 NU = NU + 1: PRINT D$"OPEN MESSAGE.BASE,
     L575": PRINT D$"WRITE MESSAGE.BASE,R"NU
2240  PRINT Q$;T$: PRINT Q$;TW$: PRINT SD$: PRINT
     ED$: PRINT ST$: PRINT ET$: FOR I = 1 TO
     8: PRINT Q$;M$(I): NEXT
2250  PRINT D$"WRITE MESSAGE.BASE,R0": PRINT
     NU: PRINT D$"CLOSE": IF MB THEN F1 = 1: GOSUB
     4720:F1 = 0
2260  PRINT : POKE 1403,20: INPUT "Do you wan
     t to add another message ?";YN$
2270  IF  LEFT$ (YN$,1) = "y" OR  LEFT$ (YN$,
     1) = "Y" THEN  TEXT : HOME : GOTO 1290
2280  RETURN
2290 FL = 0: IF  VAL ( LEFT$ (A$,2)) > 12 THEN
      GOSUB 2400: RETURN
2300  IF ( LEFT$ (A$,2) = "04" OR  LEFT$ (A$,
     2) = "06" OR  LEFT$ (A$,2) = "09" OR  LEFT$
     (A$,2) = "11") AND  VAL ( MID$ (A$,3,2))
      > 30 THEN  GOSUB 2400: RETURN
2310  IF  LEFT$ (A$,2) = "02" AND  MID$ (A$,3
```

continued on page 27

Æ Update . . .

A new method of backing up IIGS memory is introduced by Applied Engineering. A new plug-in card called RamKeeper can be used with a GS-RAM, GS-RAM Plus, and Apple IIGS memory card and most other IIGS memory cards to keep system memory intact when the computer is turned off. RamKeeper has its own battery and separate power supply that powers your IIGS memory card when the computer is turned on and when it's off. IIGS computers can now "cold boot" in about 4 seconds with programs and data available for instant response. With RamKeeper, two IIGS memory cards can reside in the same IIGS memory slot. RamKeeper has an additional benefit by reducing the strain on the Apple IIGS power supply because it no longer has to supply power to the IIGS memory card(s).

RamFactor upgrade doubles RamCharger's battery back-up time. An upgrade kit for RamFactor, consisting of two replacement chips, will double the amount of time the RamCharger battery back-up option can last in the event of a total power failure. This upgrade costs $20.00 and increases the back-up time from 6 to 12 hours for a 1 megabyte RamFactor. And with this upgrade, the back-up time for a 5 Meg RamFactor will be about 7 hours. Since RamCharger has its own built-in power supply, it can back up a RamFactor indefinitely. The reason for the improvement on RamFactor is to increase the back-up time in the event of a total power failure. The new RamFactor piggybacks are available in 1, 2, 3 and 4 megabyte sizes.

A new high performance parallel printer interface card is introduced by Applied Engineering. Parallel Pro is compatible with virtually all parallel printers and offers extensive graphics printing capabilities: hi-res, double hi-res, IIGS super hi-res screens, mixed graphics and text, emphasized, double sized and inverse text, 90° rotate, center, right and left justification, and spectacular color printing (up to 22 colors). A six foot cable is included for connection to a parallel printer. Parallel Pro sells for just $89.00. Parallel Pro has an optional plug-in buffer called Buffer Pro. Buffer Pro can free your Apple from controlling the printer and can handle up to approximately 256 pages of text. The expandable 32K Buffer sells for $89.00 and the 256K buffer sells for only $139.00.

DataLink modem chosen Editor's Choice award from inCider Magazine in the November telecommunications issue. Part of the reason why the 300/1200 baud DataLink was chosen for this prestigious honor was due to the completeness of the DataLink package. DataLink is a full-function modem that includes full-featured communication software containing on-line help screens and the most powerful macro language available in an Apple II communications program. The DataLinker software even includes a set of ready-made macros that will allow instant access to many popular services with only a few simple keystrokes. DataLinker software has even more added features since inCider chose DataLink as Editor's Choice. Version 1.1 of the DataLinker software now supports multiple start/stop bits and parity settings that make it easier to connect with even more computer services (like some college mainframes) as well as a "Chat" mode that is useful when calling another terminal program. An update to the latest version of DataLinker software costs $10.00 directly from Applied Engineering.

Applied Engineering's headquarters will be closed for the holidays. Applied Engineering will close its offices at 3:00 pm on Tuesday, December 24th and will re-open on Monday, January 4th. An order service will be in use during this time period for those who wish to have priority shipments when the office is re-opened on the 4th. If your dealer is out of stock, Applied Engineering will be able to take orders in time for Christmas delivery until December 22nd. However, try to order in advance of this date to save money on shipping expenses. Applied Engineering wishes everyone a wonderful holiday season and a happy New Year.

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LISTING 1: MESSAGE CENTER *(continued)*

```
    ,2) = "29" AND  INT ( VAL ( RIGHT$ (A$,2
    )) / 4) <  >  VAL ( RIGHT$ (A$,2)) / 4 THEN
     GOSUB 2400: RETURN
2320  IF  LEFT$ (A$,2) = "02" AND  VAL ( MID$
    (A$,3,2)) > 29 THEN  GOSUB 2400: RETURN

2330  IF  VAL ( MID$ (A$,3,2)) > 31 THEN  GOSUB
     2400: RETURN
2340  RETURN
2350 FL = 0: IF  VAL ( LEFT$ (A$,2)) > 23 THEN
     GOSUB 2400: RETURN
2360  IF  VAL ( RIGHT$ (A$,2)) > 59 THEN  GOSUB
     2400: RETURN
2370  RETURN
2380  VTAB VT: POKE 1403,HT: RETURN
2390  REM  DELETE MESSAGES
2400  CALL  - 198:FL = 1: RETURN
2410  HOME : VTAB 12: PRINT "If any files are
     deleted, any existing DISPLAY.LIST will
     be destroyed.": PRINT
2420  INPUT "Do you wish to continue ?";YN$: IF
     LEFT$ (YN$,1) = "y" OR  LEFT$ (YN$,1) =
    "Y" THEN 2450
2430  IF  LEFT$ (YN$,1) = "n" OR  LEFT$ (YN$,
    1) = "N" THEN  RETURN
2440  PRINT  CHR$ (7): GOTO 2410
2450 A$ = "DELETE MESSAGES": GOSUB 5500: VTAB
    1: POKE 1403,68: PRINT "Q to Quit";
2460  GOSUB 5620
2470  IF NU = 0 THEN  GOTO 4310
2480  IF  NOT MB THEN  GOSUB 4900: REM  READ
    MESSAGE.BASE
2490  VTAB 12: CALL  - 958
2500  GOSUB 5530: GOSUB 5590
2510  VTAB 5:B = 1:FL = 1:I = 0
2520 I = I + 1: POKE 1403,0: IF I > NU THEN  GOSUB
    5600: GOTO 2580
2530  IF I < 10 THEN  PRINT "  ";: GOTO 2550:
     REM 2 SPACES
2540  IF I < 100 THEN  PRINT " ";: REM 1 SPAC
    E
2550  PRINT I". "; LEFT$ (T$(I),74)
2560  IF  PEEK (37) = 21 AND I <  > NU THEN 2
    590
2570  IF I <  = NU THEN 2520
2580 I = I - 1: IF FL <  > 2 THEN  GOSUB 5000
    : IF I < NU THEN  VTAB 5: POKE 1403,0: CALL
     - 958: GOSUB 5530: GOSUB 5590: GOTO 261
    0
2590  GOSUB 5610
2600  GOSUB 5000:B = I + 1: VTAB 5: POKE 1403
    ,0: CALL  - 958: GOSUB 5530: GOSUB 5590
2610  VTAB 5: GOTO 2570
2620  REM  MAKE DISPLAY.LIST
2630 A$ = "MAKE DISPLAY LIST": GOSUB 5500: VTAB
    1: POKE 1403,68: PRINT "Q to Quit";
2640  GOSUB 5620
2650 C = 0:CT = 0
2660  IF NU = 0 THEN  GOTO 4310
2670  IF  NOT MB THEN  GOSUB 4900: REM  READ
    MESSAGE.BASE
2680  IF MB THEN  FOR I = 1 TO NU:T$(I) =  LEFT$
    (T$(I),74): NEXT
2690  VTAB 12: CALL  - 868
2700  GOSUB 5530: GOSUB 5590
2710  VTAB 5:B = 1:I = 0
2720 I = I + 1: POKE 1403,0: IF I > NU THEN  GOSUB
    5600: GOTO 2790
2730  IF I < 10 THEN  PRINT "  ";: GOTO 2750:
     REM  2 SPACES
2740  IF I < 100 THEN  PRINT " ";: REM 1 SPAC
    E
2750  PRINT I". ";: IF  RIGHT$ (T$(I),1) = "_
    " THEN  INVERSE : PRINT  LEFT$ (T$(I),74
    ): NORMAL : GOTO 2770
2760  PRINT  LEFT$ (T$(I),74)
2770  IF  PEEK (37) = 21 AND I <  > NU THEN 2
    810
2780  IF I <  = NU THEN 2720
2790 I = I - 1: IF FL <  > 2 THEN  GOSUB 5000
    : IF I < NU THEN  VTAB 5: POKE 1403,0: CALL
     - 958: GOSUB 5530: GOSUB 5590: GOTO 284
    0
2800  GOTO 2850
2810  GOSUB 5610: GOTO 2820
2820  GOSUB 5000:B = I + 1: VTAB 5: POKE 1403
    ,0: CALL  - 958: GOSUB 5530: GOSUB 5590
2830  IF FL = 2 THEN I = NU
2840  GOSUB 5420: VTAB 5: GOTO 2780
2850  REM  WRITE NEW DISPLAY.LIST
2860  IF C = 0 THEN  RETURN
2870  VTAB 23: POKE 1403,0: CALL  - 958: PRINT
    "Creating DISPLAY.LIST. Please wait...";
2880  PRINT D$"OPEN DISPLAY.LIST": PRINT D$"W
    RITE DISPLAY.LIST"
2890  FOR I = 1 TO CT: IF DS(I) > 0 THEN  PRINT
    DS(I)
2900  NEXT : PRINT  - 1
2910  PRINT D$"CLOSE": RETURN
2920  REM  DISPLAY MESSAGES
2930  TEXT : HOME :A$ = "*** MESSAGE CENTER *
    **": GOSUB 5710
2940  PRINT D$"OPEN "PF$",TDIR": PRINT D$"REA
    D "PF$
2950  INPUT A$: IF  MID$ (A$,2,12) = "DISPLAY
    .LIST" THEN  PRINT D$"CLOSE": GOSUB 3520
    :DL = 1: GOTO 3100
2960  IF  LEFT$ (A$,6) = "BLOCKS" THEN  PRINT
    D$"CLOSE": GOTO 2980
2970  GOTO 2950
2980  IF NU = 0 THEN  GOTO 4310
2990  VTAB 12:A$ = "Please wait, creating a d
    isplay list.": GOSUB 5710
3000  IF CL THEN  GOSUB 5640:S1 =  VAL (MN$ +
    DA$):T1 =  VAL (HR$ + MI$)
3010  PRINT D$"OPEN MESSAGE.BASE,L575":C = 0
3020  FOR I = 1 TO NU: PRINT D$"READ MESSAGE.
    BASE,R"I
3030  INPUT T$,TW$,SD$,ED$,ST$,ET$
3040  IF  LEFT$ (TW$,3) <  > "ALL" THEN 3090
3050  IF CL = 0 THEN  GOSUB 3480: GOTO 3090
3060  IF SD$ = "000000" AND ED$ = SD$ THEN  GOSUB
    3480: GOTO 3090
3070  IF SD$ = "000000" AND  VAL ( LEFT$ (ED$
    ,4)) >  = S1 THEN  GOSUB 3480: GOTO 3090
3080  IF  VAL ( LEFT$ (SD$,4)) <  = S1 AND  VAL
    ( LEFT$ (ED$,4)) >  = S1 THEN  GOSUB 348
    0
3090  NEXT : PRINT D$"CLOSE"
3100 A = 0: VTAB 1: POKE 1403,0: PRINT "ESC t
    o Quit": PRINT "TAB for Next Message": GOSUB
    5520
3110 D = 0: FOR I = 1 TO C: IF CL THEN  GOSUB
    5640: TEXT : VTAB 1: POKE 1403,65: PRINT
    MN$"/"DA$"/"YR" "HR$":"MI$;: VTAB 3
3120  PRINT D$"OPEN /RAM/MSG,L575": PRINT D$"
    READ /RAM/MSG,R"I
3130  INPUT SD$,ED$,ST$,ET$: IF SD$ = "" THEN
    GOSUB 3300: GOTO 3190
3140  IF  NOT CL THEN  GOSUB 3300: GOTO 3190
3150  IF SD$ = "000000" AND ST$ = "0000" AND
    ET$ = ST$ THEN  GOSUB 3300: GOTO 3190
3160  IF SD$ = "000000" AND (ST$ <  = HR$ + M
    I$ AND ET$ >  = HR$ + MI$) THEN  GOSUB 3
    300: GOTO 3190
3170  IF ( LEFT$ (SD$,4) <  = MN$ + DA$ AND M
    N$ + DA$ <  =  LEFT$ (ED$,4)) THEN  IF (
    ST$ = "0000" AND ET$ = ST$) THEN  GOSUB
    3300: GOTO 3190
3180  IF (ST$ <  = HR$ + MI$ AND ET$ >  = HR$
     + MI$) AND  LEFT$ (ED$,4) >  = MN$ + DA
    $ THEN  GOSUB 3300
3190  PRINT D$"CLOSE": NEXT : IF D = 0 THEN 3
    210
3200  GOTO 3110
3210  IF DL = 1 THEN  PRINT D$"DELETE DISPLAY
    .LIST"
3220 DL = 0: PRINT D$"DELETE /RAM/MSG": RETURN

3230  PRINT D$"CLOSE": PRINT D$"DELETE /RAM/M
    SG": IF  NOT DL THEN  RETURN
3240  VTAB 4: POKE 1403,0: CALL  - 958
3250  VTAB 12: INPUT "Do you want to delete t
    he current DISPLAY.LIST file?";YN$
3260  IF  LEFT$ (YN$,1) = "n" OR  LEFT$ (YN$,
    1) = "N" THEN 3290
3270  IF  LEFT$ (YN$,1) = "y" OR  LEFT$ (YN$,
    1) = "Y" THEN  PRINT D$"DELETE DISPLAY.L
    IST": GOTO 3290
```

LISTING 1: MESSAGE CENTER *(continued)*

```
3280  PRINT  CHR$ (7): VTAB 12: CALL  - 958: GOTO
     3250
3290 DL = 0: RETURN
3300  FOR J = 1 TO 8: INPUT M$(J): NEXT
3310 D = D + 1:A = A + 1: IF A = 3 THEN A = 1
3320  TEXT : ON A GOSUB 3400,3440: FOR J = 1 TO
     8: IF  PEEK (64448) = 234 AND A = 1 THEN
      PRINT " ";: REM  1 SPACE
3330  IF J = 8 THEN  PRINT M$(J);: GOTO 3350
3340  PRINT M$(J)
3350  NEXT : VTAB 12: IF GS THEN T = 6000: GOTO
     3370
3360 T = 2000
3370  FOR J = 1 TO T:X =  PEEK ( - 16384): IF
     X = 155 THEN  POKE  - 16368,0: POP : TEXT
     : GOTO 3230
3380  IF X = 137 THEN J = T
3390  NEXT : POKE  - 16368,0: RETURN
3400  VTAB 4: POKE 1403,0: INVERSE : FOR J =
     1 TO 66: PRINT " ";: NEXT : PRINT : REM
       1 SPACE
3410  FOR J = 1 TO 8: POKE 1403,0: PRINT " ";
     : POKE 1403,65: PRINT " ": NEXT : REM
     1 SPACE
3420  POKE 1403,0: FOR J = 1 TO 66: PRINT " "
     ;: NEXT : NORMAL : REM   1 SPACE
3430  POKE 32,3: POKE 33,62: POKE 34,4: POKE
     35,12: HOME : RETURN
3440  VTAB 15: POKE 1403,13: INVERSE : FOR J =
     1 TO 66: PRINT " ";: NEXT : PRINT : REM
     1 SPACE
3450  FOR J = 1 TO 8: POKE 1403,13: PRINT " "
     ;: POKE 1403,78: PRINT " ": NEXT : REM
     1 SPACE
3460  POKE 1403,13: FOR J = 1 TO 66: PRINT "
     ";: NEXT : NORMAL : REM   1 SPACE
3470  POKE 32,16: POKE 33,62: POKE 34,15: POKE
     35,23: HOME : RETURN
3480  FOR J = 1 TO 8: INPUT M$(J): NEXT
3490 C = C + 1: PRINT D$"OPEN /RAM/MSG,L575":
      PRINT D$"WRITE /RAM/MSG,R"C
3500  PRINT SD$: PRINT ED$: PRINT ST$: PRINT
     ET$: FOR J = 1 TO 8: PRINT Q$;M$(J): NEXT

3510  PRINT D$"CLOSE /RAM/MSG": RETURN
3520  REM  READ DISPLAY.LIST
3530 C = 0
3540  VTAB 12:A$ = "Please wait, retrieving m
     essages.": GOSUB 5710
3550  PRINT D$"OPEN DISPLAY.LIST": PRINT D$"R
     EAD DISPLAY.LIST"
3560  INPUT A: IF A =  - 1 THEN 3580
3570 C = C + 1:DS(C) = A: GOTO 3560
3580  PRINT D$"CLOSE"
3590  FOR I = 1 TO C:A = DS(I)
3600  PRINT D$"OPEN MESSAGE.BASE,L575": PRINT
     D$"READ MESSAGE.BASE,R"A: INPUT T$,TW$,S
     D$,ED$,ST$,ET$: FOR J = 1 TO 8: INPUT M$
     (J): NEXT : PRINT D$"CLOSE MESSAGE.BASE"
3610  PRINT D$"OPEN /RAM/MSG,L575": PRINT D$"
     WRITE /RAM/MSG,R"I: PRINT SD$: PRINT ED$
     : PRINT ST$: PRINT ET$: FOR J = 1 TO 8: PRINT
     Q$;M$(J): NEXT : PRINT D$"CLOSE /RAM/MSG
     "
3620  NEXT : RETURN
3630  REM  PERSONAL MESSAGES
3640  TEXT : HOME :A$ = "*** PERSONAL MESSAGE
     S ***": GOSUB 5710
3650  IF NU = 0 THEN  GOTO 4310
3660  VTAB 12: INPUT "Please enter your name:
     ";YN$: IF  LEN (YN$) > 20 THEN  VTAB 12:
      PRINT  CHR$ (7): CALL  - 958: GOTO 3660
3670  IF  LEN (YN$) = 0 THEN  RETURN
3680  VTAB 12: CALL  - 958: VTAB 12: PRINT "S
     earching for messages to ";: INVERSE : PRINT
     YN$: NORMAL
3690  IF CL THEN  GOSUB 5640:S1 =  VAL (MN$ +
     DA$):T1 =  VAL (HR$ + MI$)
3700  PRINT D$"OPEN MESSAGE.BASE,L575":C = 0
3710  FOR I = 1 TO NU: PRINT D$"READ MESSAGE.
     BASE,R"I
3720  INPUT T$,TW$,SD$,ED$,ST$,ET$
3730  IF  LEFT$ (TW$,3) = "ALL" THEN 3790
3740  IF  LEFT$ (TW$, LEN (YN$)) <  > YN$ THEN
     3790
3750  IF SD$ = "000000" AND ED$ = SD$ THEN  GOSUB
     3480: GOTO 3790
3760  IF SD$ = "000000" AND  VAL ( LEFT$ (ED$
     ,4)) >  = S1 THEN  GOSUB 3480: GOTO 3790
3770  IF ( LEFT$ (SD$,4) <  = MN$ + DA$ AND M
     N$ + DA$ <  =  LEFT$ (ED$,4)) THEN  IF (
     ST$ = "0000" AND ET$ = ST$) THEN  GOSUB
     3480: GOTO 3790
3780  IF  VAL ( LEFT$ (SD$,4)) <  = S1 AND  VAL
     ( LEFT$ (ED$,4)) >  = S1 THEN  GOSUB 348
     0
3790  NEXT : PRINT D$"CLOSE"
3800  IF C > 0 THEN  VTAB 12: CALL  - 958: GOTO
     3100
3810  VTAB 14: PRINT  CHR$ (7)"There are no m
     essages for "YN$".": PRINT
3820  PRINT "Press RETURN for the main menu."
3830 X =  PEEK ( - 16384): IF X = 141 THEN  POKE
      - 16368,0: RETURN
3840  GOTO 3830
3850  REM  PURGE DELETED MESSAGES
3860  TEXT : HOME :A$ = "Purge Deleted Messag
     es": GOSUB 5510
3870 FL = 0: IF NU = 0 THEN 4310
3880  VTAB 10: CALL  - 958: VTAB 12:A$ = "Pur
     ging deleted messages. Please wait.": GOSUB
     5710
3890  PRINT D$"OPEN "PF$",TDIR": PRINT D$"REA
     D "PF$
3900  INPUT A$
3910  IF  MID$ (A$,2,12) = "MESSAGE.BASE" THEN
     B =  VAL ( MID$ (A$,25,4))
3920  IF  MID$ (A$,2,12) = "DISPLAY.LIST" THEN
     FL = 1
3930  IF  LEFT$ (A$,5) = "BLOCK" THEN BF =  VAL
     ( MID$ (A$,14,4)): PRINT D$"CLOSE": GOTO
     3950
3940  GOTO 3900
3950  IF B > BF THEN 4090: REM  NOT ENOUGH SP
     ACE ON DISK
3960 C = 0
3970  PRINT D$"OPEN MESSAGE.BASE,L575": PRINT
     D$"OPEN TEMP,L575"
3980  FOR I = 1 TO NU: PRINT D$"READ MESSAGE.
     BASE,R"I
3990  INPUT T$: IF  LEFT$ (T$,8) = "_DELETED"
      THEN 4040
4000  INPUT TW$,SD$,ED$,ST$,ET$: FOR J = 1 TO
     8: INPUT M$(J): NEXT
4010 C = C + 1
4020  PRINT D$"WRITE TEMP,R"C
4030  PRINT Q$;T$: PRINT Q$;TW$: PRINT SD$: PRINT
     ED$: PRINT ST$: PRINT ET$: FOR J = 1 TO
     8: PRINT Q$;M$(J): NEXT
4040  NEXT : PRINT D$"WRITE TEMP,R0": PRINT C
     : PRINT D$"CLOSE"
4050  PRINT D$"DELETE MESSAGE.BASE"
4060  PRINT D$"RENAME TEMP,MESSAGE.BASE"
4070  IF FL THEN FL = 0: PRINT D$"DELETE DISP
     LAY.LIST"
4080 NU = C:MB = 0: RETURN
4090  VTAB 12: CALL  - 958
4100 A$ = "Using /RAM to purge the message da
     ta base.": GOSUB 5710
4110 C = 0
4120  PRINT D$"OPEN MESSAGE.BASE,L575": PRINT
     D$"OPEN /RAM/TEMP,L575"
4130  FOR I = 1 TO NU: PRINT D$"READ MESSAGE.
     BASE,R"I
4140  INPUT T$: IF  LEFT$ (T$,8) = "_DELETED"
      THEN 4190
4150  INPUT TW$,SD$,ED$,ST$,ET$: FOR J = 1 TO
     8: INPUT M$(J): NEXT
4160 C = C + 1
4170  PRINT D$"WRITE /RAM/TEMP,R"C
4180  PRINT Q$;T$: PRINT Q$;TW$: PRINT SD$: PRINT
     ED$: PRINT ST$: PRINT ET$: FOR J = 1 TO
     8: PRINT Q$;M$(J): NEXT
4190  NEXT : PRINT D$"WRITE /RAM/TEMP,R0": PRINT
     C: PRINT D$"CLOSE"
4200  PRINT D$"DELETE MESSAGE.BASE"
4210  VTAB 12: CALL  - 958:A$ = "Rewriting pu
     rged message data base to main disk.": GOSUB
     5710
```

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LISTING 1: MESSAGE CENTER *(continued)*

```
4220  PRINT D$"OPEN /RAM/TEMP,L575": PRINT D$
      "OPEN MESSAGE.BASE,L575"
4230  FOR I = 1 TO C: PRINT D$"READ /RAM/TEMP
      ,R"I
4240  INPUT T$,TW$,SD$,ED$,ST$,ET$: FOR J = 1
      TO 8: INPUT M$(J): NEXT
4250  PRINT D$"WRITE MESSAGE.BASE,R"I
4260  PRINT Q$;T$: PRINT Q$;TW$: PRINT SD$: PRINT
     ED$: PRINT ST$: PRINT ET$: FOR J = 1 TO
     8: PRINT Q$;M$(J): NEXT
4270  NEXT : PRINT D$"WRITE MESSAGE.BASE,RØ":
      PRINT C: PRINT D$"CLOSE"
4280  PRINT D$"DELETE /RAM/TEMP"
4290  GOTO 4Ø7Ø
4300  REM  NO MESSAGES IN DATA BASE
4310  IF NU = Ø THEN  VTAB 12: PRINT  CHR$ (7
     )"There are no messages in the data base
     .": PRINT : PRINT "Press a key for the p
     rogram menu.";: GET A$: PRINT A$: RETURN

4320  REM  EDIT A MESSAGE
4330 A$ = "EDIT A MESSAGE": GOSUB 55ØØ: VTAB
     1:ED = 1:FL = Ø
4340  GOSUB 562Ø
4350  IF NU = Ø THEN  GOTO 431Ø
4360  IF R > Ø THEN 438Ø
4370  IF  NOT MB THEN  GOSUB 49ØØ: REM READ M
     ESSAGE.BASE
4380  VTAB 12: CALL  - 868
4390  GOSUB 553Ø: GOSUB 559Ø
4400  VTAB 5:B = 1:I = Ø
4410 I = I + 1: POKE 14Ø3,Ø: IF I > NU THEN  GOSUB
     56ØØ: GOTO 447Ø
4420  IF I < 1Ø THEN  PRINT "  ";: GOTO 444Ø:
      REM 2 SPACES
4430  IF I < 1ØØ THEN  PRINT " ";: REM 1 SPAC
     E
4440  PRINT I". "; LEFT$ (T$(I),74)
4450  IF  PEEK (37) = 21 AND I <  > NU THEN 4
     49Ø
4460  IF I <  = NU THEN 441Ø
4470 I = I - 1: IF FL <  > 2 THEN  GOSUB 5ØØØ
     : IF I < NU THEN  VTAB 5: POKE 14Ø3,Ø: CALL
      - 958: GOSUB 553Ø: GOSUB 559Ø: GOTO 452
     Ø
4480  GOTO 453Ø
4490  GOSUB 561Ø
4500  GOSUB 5ØØØ: IF FL = 2 THEN 453Ø
4510 B = I + 1: VTAB 5: POKE 14Ø3,Ø: CALL  -
     958: GOSUB 553Ø: GOSUB 559Ø
4520  VTAB 5: GOTO 446Ø
4530  VTAB 9: POKE 14Ø3,8: INVERSE : FOR I =
     1 TO 63: PRINT " ";: NEXT : PRINT : REM
       1 SPACE
4540  FOR I = 1 TO 8: POKE 14Ø3,8: PRINT " ";
     : POKE 14Ø3,7Ø: PRINT " ": NEXT : REM
     1 SPACE
4550  POKE 14Ø3,8: FOR I = 1 TO 63: PRINT " "
     ;: NEXT : NORMAL : REM 1 SPACE
4560  VTAB 22: POKE 14Ø3,Ø: CALL  - 958
4570  POKE 32,1Ø: POKE 33,6Ø: POKE 34,9: POKE
     35,17: HOME
4580  FOR I = 1 TO 8: IF  LEN (M$(I)) = 6Ø AND
     I <  > 8 THEN  POKE 33,62: PRINT M$(I);:
      INVERSE : PRINT " ": NORMAL : POKE 33,6
     Ø: GOTO 462Ø
4590  IF  LEN (M$(I)) = 6Ø AND I = 8 THEN  POKE
     33,62: PRINT M$(I);: INVERSE : PRINT " "
     ;: NORMAL : POKE 33,6Ø: GOTO 462Ø
4600  IF I = 8 THEN  PRINT M$(I);: GOTO 462Ø
4610  PRINT M$(I)
4620  NEXT : TEXT : GOSUB 14ØØ
4630  PRINT : POKE 14Ø3,2Ø: PRINT "Is this in
     formation correct? (Y/N/ESC to cancel) "
     ;
4640 X =  PEEK ( - 16384)
4650  IF X = 155 THEN  POKE  - 16368,Ø: RETURN

4660  IF X = 217 OR X = 249 THEN  POKE  - 163
     68,Ø: GOTO 469Ø
4670  IF X = 2Ø6 OR X = 238 THEN  POKE  - 163
     68,Ø: VTAB 16: CALL  - 958: GOSUB 168Ø: GOTO
     463Ø
4680  GOTO 464Ø
4690  PRINT D$"OPEN MESSAGE.BASE,L575": PRINT
     D$"WRITE MESSAGE.BASE,R"R
4700  PRINT Q$;T$: PRINT Q$;TW$: PRINT SD$: PRINT
     ED$: PRINT ST$: PRINT ET$: FOR I = 1 TO
     8: PRINT Q$;M$(I): NEXT
4710  PRINT D$"CLOSE": IF  LEFT$ (TW$,3) <  >
     "ALL" THEN TW$ = "PERSONAL"
4720  IF  LEN (T$) < 25 THEN T$ = T$ + " ": GOTO
     472Ø: REM  1 SPACE
4730  IF  LEN (TW$) < 2Ø THEN TW$ = TW$ + " "
     : GOTO 473Ø: REM  1 SPACE
4740 SD$ =  LEFT$ (SD$,2) + "/" +  MID$ (SD$,
     3,2) + "/" +  RIGHT$ (SD$,2) + " ": REM
     1 SPACE
4750 ED$ =  LEFT$ (ED$,2) + "/" +  MID$ (ED$,
     3,2) + "/" +  RIGHT$ (ED$,2) + " ": REM
     1 SPACE
4760 ST$ =  LEFT$ (ST$,2) + ":" +  RIGHT$ (ST
     $,2) + " ": REM  1 SPACE
4770 ET$ =  LEFT$ (ET$,2) + ":" +  RIGHT$ (ET
     $,2): IF F1 THEN R = NU
4780 T$(R) = T$ + TW$ + SD$ + ED$ + ST$ + ET$
     : IF F1 THEN  RETURN
4790  TEXT : HOME : VTAB 12: INPUT "Do you wa
     nt to edit another message?";YN$: IF  LEFT$
     (YN$,1) = "n" OR  LEFT$ (YN$,1) = "N" THEN
      RETURN
4800  IF  LEFT$ (YN$,1) = "y" OR  LEFT$ (YN$,
     1) = "Y" THEN  HOME : GOTO 433Ø
4810  PRINT  CHR$ (7): GOTO 479Ø
4820  REM  EXIT TO BASIC
4830  VTAB 24: POKE 14Ø3,Ø: CALL  - 958
4840  PRINT "Press 'Q' to quit, any other key
      for the menu.";
4850 X =  PEEK ( - 16384): IF X = 2Ø9 OR X =
     241 THEN  POKE  - 16368,Ø: GOTO 488Ø
4860  IF X > 128 THEN  POKE  - 16368,Ø: GOTO
     127Ø
4870  GOTO 485Ø
4880  TEXT : HOME : PRINT D$"PREFIX"PR$: END

4890  REM  READ TOPICS FROM MESSAGE.BASE
4900  VTAB 12:A$ = "Please wait. Message topi
     cs being retrieved.": GOSUB 571Ø
4910  PRINT D$"OPEN MESSAGE.BASE,L575": FOR I
      = 1 TO NU: PRINT D$"READ MESSAGE.BASE,R
     "I: INPUT A$,B$,C$,E$,F$,G$: IF  LEFT$ (
     B$,3) <  > "ALL" THEN B$ = "PERSONAL"
4920  IF  LEN (A$) < 25 THEN A$ = A$ + " ": GOTO
     492Ø
4930  IF  LEN (B$) < 2Ø THEN B$ = B$ + " ": GOTO
     493Ø
4940 C$ =  LEFT$ (C$,2) + "/" +  MID$ (C$,3,2
     ) + "/" +  RIGHT$ (C$,2) + " ": REM  1 S
     PACE
4950 E$ =  LEFT$ (E$,2) + "/" +  MID$ (E$,3,2
     ) + "/" +  RIGHT$ (E$,2) + " ": REM  1 S
     PACE
4960 F$ =  LEFT$ (F$,2) + ":" +  RIGHT$ (F$,2
     ) + " ": REM   1 SPACE
4970 G$ =  LEFT$ (G$,2) + ":" +  RIGHT$ (G$,2
     )
4980 T$(I) = A$ + B$ + C$ + E$ + F$ + G$: NEXT
     I: PRINT D$"CLOSE":MB = 1: RETURN
4990  REM MOVE CURSOR FOR DELETE & DISPLAY.LI
     ST SEQ.
5000 VT = 5:HT = Ø:T = B:E = I:P = 1: POKE  -
     16368,Ø
5010  GOSUB 238Ø: INVERSE :A$ =  STR$ (T): GOSUB
     547Ø
5020  PRINT A$;: NORMAL
5030 X =  PEEK ( - 16384): IF X = 155 THEN  POKE
      - 16368,Ø: POP : FOR I = 1 TO CT:DS(I) =
     Ø: NEXT : RETURN
5040  IF (X = 2Ø9 OR X = 241) AND FL THEN  POKE
      - 16368,Ø: POP : RETURN
5050  IF (X = 2Ø9 OR X = 241) AND  NOT FL THEN
      POKE  - 16368,Ø:FL = 2: RETURN
5060  IF ( PEEK (49249) > 127 OR  PEEK (4925Ø
     ) > 127) AND X = 137 THEN  POKE  - 16368
     ,Ø: GOTO 513Ø
5070  IF X = 137 AND NU > E THEN  POKE  - 163
     68,Ø: RETURN
5080  IF X = 137 THEN  POKE  - 16368,Ø:X = Ø
```

continued on page 35

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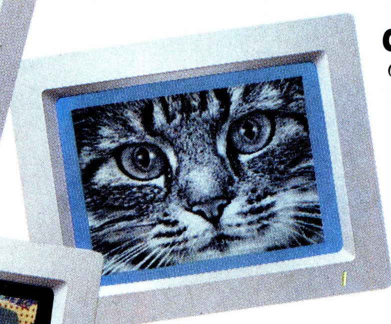
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CIRCLE NUMBER 8



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You command vast power with RamWorks III — up to 12 times more memory than your IIe came with.

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Memory intensive software like AppleWorks runs faster. You can put Pinpoint or MacroWorks *and* your spelling checking into RAM at the same time for instant response. And you can work with massive files without constantly going back to your disk drive.

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With 512K or larger RamWorks, *all* of AppleWorks (including printer routines) automatically loads into RAM.

The result? AppleWorks runs up to 20 times faster. You don't waste time accessing the program disk drive. You switch instantly from word processing to spreadsheets to database. Anytime. And without wear on disk drives.

No other expansion board, not even Apple's, gets so much out of AppleWorks.

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RamWorks automatically segments large files so they can be saved on two or more disks. When you need to work with the file, you simply load it in the same sequence you saved it.

Add up to 3 MEG without using a single expansion slot.

RamWorks III, even when it's carrying its full 3 MEG of new memory, fits in your IIe's auxiliary slot. Your valuable expansion Slots 1 through 7 are free for other peripheral cards.



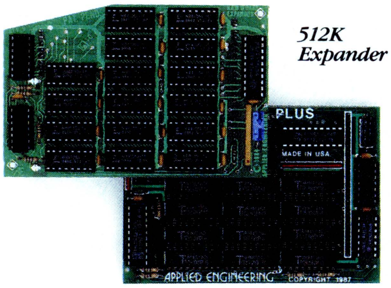
RamWorks III expansion board

If you don't need all of that power now, you can start with as little as 64K. It's easy to add memory to the expandable RamWorks III board as your needs grow.

You can go to 1 MEG on the main board using standard RAMs. That's

more memory than most people ever use. (1 MEG is about 500 pages of text.)

For even more power, snap an Applied 512K, 1 MEG or 2 MEG expander card into the RamWorks III low profile connector. The expander card won't interfere with Slot 1.



512K Expander

2 MEG plus Expander

Recover your investment in the wrong card.

Most of it anyway.

If you bought some one else's RAM card — one that's not recognized by your programs — RamWorks III can help recoup your loss. Pull the memory chips off your old card and plug them into RamWorks III.

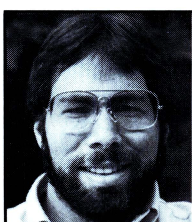
Truly compatible.

RamWorks III is compatible with more off-the-shelf software than any other RAM card. It is recognized by all memory intensive programs.

Its power enhances AppleWorks, Pinpoint, Howard-Soft, FlashCalc, Pro-FILER, Managing Your Money, Super-Calc 3a, VIP Professional and many, many more ... even software written specifically for Apple cards.

RamWorks III is compatible with most hardware add-ons like ProFile and Sider hard disks.

Of course, RamWorks III is fully compatible with all IIe's — enhanced or unenhanced, American or European.



"I wanted a memory card for my Apple that was fast, easy to use, and very compatible; so I bought RamWorks."

Steve Wozniak, the creator of Apple Computer.

Easy to install and use.

RamWorks III quickly plugs into your IIe's auxiliary slot. You get memory expansion and super-sharp 80 column text (U.S. Patent 4601018).

RamWorks III comes with everything you need to get up and running. The easy-to-understand manual shows you how to get the most from your new memory. The two accompanying 5¼" disks include a graphics utility program, AppleWorks enhancement program, ProDOS and DOS 3.3 RamDrive™ and other useful utility software.

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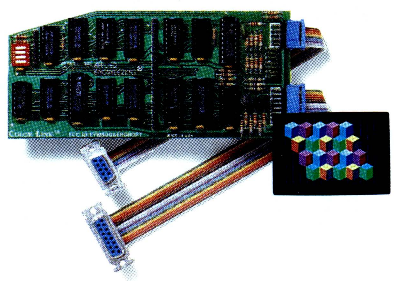
It meets all Apple standards for RGB output control. So it's compatible with more off-the-shelf software.

You can use Apple or IBM RGB monitors. ColorLink provides Apple standard analog and IBM standard digital RGB outputs (cables included).

ColorLink offers four text colors so you can use the one that's easiest on your eyes (others offer only green).

The ColorLink option plugs into the back of RamWorks III. It doesn't interfere with Slot 1.

You can order ColorLink with your RamWorks III board or add it later.



ColorLink® RGB option. IBM digital output cable. Apple analog output cable.

Optional 16 bit power.

You can explore powerful programming possibilities with Applied's optional 65C816 card. It's capable of linearally addressing more than 1 MEG.

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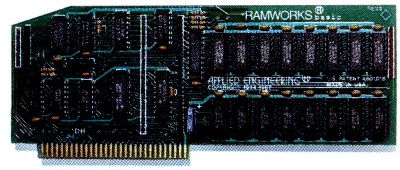
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512K Expander	$ 199
2 MEG Plus Expander with 1 MEG	$ 599
2 MEG Plus Expander with 2 MEG	$1099
65C816 16 Bit Card	$ 159
ColorLink RGB Option	$ 129
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CIRCLE NUMBER 9

LISTING 1: MESSAGE CENTER *(continued)*

```
5090  IF X = 138 OR X = 149 THEN  GOSUB 5160:
       GOTO 5120
5100  IF X = 136 OR X = 139 THEN  GOSUB 5180:
       GOTO 5120
5110  IF X = 141 THEN 5200
5120  GOTO 5030
5130  IF I - 34 < 0 THEN 5090
5140  IF I = NU THEN I = I - ((NU - (17 *  INT
      (NU / 17))) + 17):B = I + 1: RETURN
5150 I = I - 34:B = B - 34: RETURN
5160  POKE  - 16368,0: IF (P + B) - 1 = E THEN
       GOSUB 2380:A$ =  STR$ (E): GOSUB 5470: PRINT
      A$;:P = (T - B) + 1:VT = 5: INVERSE :A$ =
       STR$ (T): GOSUB 5470: GOSUB 2380: PRINT
      A$;: NORMAL : RETURN
5170 A$ =  STR$ (P + B - 1): GOSUB 5470: GOSUB
      2380: PRINT A$:P = P + 1:VT = VT + 1:A$ =
       STR$ (P + B - 1): GOSUB 5470: GOSUB 238
      0: INVERSE : PRINT A$;: NORMAL : RETURN

5180  POKE  - 16368,0: IF (P + B) - 1 = T THEN
       GOSUB 2380:A$ =  STR$ (T): GOSUB 5470: PRINT
      A$;:P = (E - B) + 1:VT = (E - B) + 5: INVERSE
      :A$ =  STR$ (E): GOSUB 5470: GOSUB 2380:
       PRINT A$;: NORMAL : RETURN
5190 A$ =  STR$ (P + B - 1): GOSUB 5470: GOSUB
      2380: PRINT A$:P = P - 1:VT = VT - 1:A$ =
       STR$ (P + B - 1): GOSUB 5470: GOSUB 238
      0: INVERSE : PRINT A$;: NORMAL : RETURN

5200  POKE  - 16368,0
5210  IF ED THEN 5430
5220  IF  NOT FL THEN  GOSUB 5350: GOTO 5030
5230  VTAB 23: CALL  - 958: VTAB 23: POKE 140
      3,0: PRINT "Press the DELETE key to conf
      irm, any other key to abort.";
5240 X =  PEEK ( - 16384): IF X = 255 THEN  POKE
       - 16368,0: GOTO 5270
5250  IF X > 128 THEN  POKE  - 16368,0: GOTO
      5300
5260  GOTO 5240
5270  VTAB 24: POKE 1403,0: CALL  - 958: VTAB
      24: PRINT "Message being deleted.";
5280 T$(P + B - 1) = "_DELETED":DE = 1
5290  PRINT D$"OPEN MESSAGE.BASE,L575": PRINT
      D$"WRITE MESSAGE.BASE,R"(P + B - 1): PRINT
      T$(P + B - 1): FOR J = 1 TO 13: PRINT : NEXT
      : PRINT D$"CLOSE"
5300  GOSUB 2380:A$ =  STR$ (P + B - 1): GOSUB
      5470
5310  INVERSE : PRINT A$;: NORMAL : CALL  - 8
      68: PRINT ". "T$(P + B - 1)
5320  VTAB 23: CALL  - 958: GOSUB 5530: GOSUB
      5590: IF I = NU THEN  GOSUB 5600: GOTO 5
      030
5330  IF NU > I THEN  PRINT "TAB for more";: IF
      I - 17 > 0 THEN  PRINT ", OPEN-APPLE-TAB
       to go back";
5340  GOTO 5030
5350 C = C + 1:CT = CT + 1:SS = 0
5360  IF  MID$ (T$(P + B - 1),26,3) <  > "ALL
      " THEN C = C - 1:CT = CT - 1: RETURN
5370 SS = SS + 1: IF SS > CT THEN 5400
5380  IF DS(SS) = P + B - 1 THEN C = C - 2:DS
      (SS) = 0: VTAB VT: POKE 1403,5:T$(P + B -
      1) =  LEFT$ (T$(P + B - 1),74): PRINT T$
      (P + B - 1): GOTO 5420
5390  GOTO 5370
5400  IF  RIGHT$ (T$(P + B - 1),1) = "_" THEN
      C = C - 1:CT = CT - 1: RETURN
5410 DS(CT) = P + B - 1: INVERSE : VTAB VT: POKE
      1403,5: PRINT T$(P + B - 1): NORMAL :T$(
      P + B - 1) = T$(P + B - 1) + "_"
5420  VTAB 24: POKE 1403,60: PRINT "Topics se
      lected:";: INVERSE : PRINT C;: NORMAL : RETURN

5430 R = P + B - 1: PRINT D$"OPEN MESSAGE.BAS
      E,L575": PRINT D$"READ MESSAGE.BASE,R"R
5440  INPUT T$,TW$,SD$,ED$,ST$,ET$: FOR J = 1
       TO 8: INPUT M$(J): NEXT
5450  PRINT D$"CLOSE"
5460  HOME :A$ = "EDIT A MESSAGE": GOSUB 5500
      :FL = 2: RETURN
5470  IF  LEN (A$) < 3 THEN A$ = " " + A$: GOTO
      5470
5480  RETURN
5490  REM  Header Line
5500  TEXT : HOME : PRINT "ESC to cancel";
5510  GOSUB 5710
5520  PRINT "================================
      ========================================
      ========";: RETURN : REM  80 '='
5530  VTAB 22: POKE 1403,0: GOSUB 5520: RETURN

5540  REM  PRINT DATE & TIME
5550  POKE  - 16368,0: GOSUB 5640: VTAB 24: POKE
      1403,60
5560  PRINT MN$"/"DA$"/"YR"  "HR$":"MI$;: RETURN

5570  VTAB 22: POKE 1403,0: VTAB 23: GOSUB 55
      20: PRINT "Use arrows or enter number an
      d press RETURN";
5580  RETURN
5590  PRINT "Use arrow and press RETURN to se
      lect.": RETURN
5600  VTAB 24: PRINT "OPEN-APPLE-TAB to go ba
      ck";: RETURN
5610  VTAB 24: PRINT "TAB for more, OPEN-APPL
      E-TAB to go back.";: RETURN
5620  VTAB 3: POKE 1403,0: PRINT "NO.  TOPIC"
      ; SPC( 20);"TO"; SPC( 18);"S.DATE   E.DA
      TE   S.T.  E.T.": VTAB 4: GOSUB 5520: RETURN

5630  REM  Read Clock Using MLI
5640  POKE 768,32: POKE 769,0: POKE 770,191: POKE
      771,130: POKE 774,96: CALL 768
5650 HR = 100 +  PEEK (49043):MI = 100 +  PEEK
      (49042):DA =  PEEK (49040) -  INT ( PEEK
      (49040) / 32) * 32:DA = DA + 100
5660 YR =  INT ( PEEK (49041) / 2):MN = ( INT
      ( PEEK (49040) / 32) + ( PEEK (49041) -
      (YR * 2)) * 8) + 100
5670 HR$ =  RIGHT$ ( STR$ (HR),2):MI$ =  RIGHT$
      ( STR$ (MI),2):DA$ =  RIGHT$ ( STR$ (DA)
      ,2):MN$ =  RIGHT$ ( STR$ (MN),2)
5680  RETURN
5690  HOME : VTAB 12: PRINT "THIS PROGRAM REQ
      UIRES AN APPLE //E, //C OR GS WITH AN 80
       COLUMN CARD.": END
5700  REM  Center Text
5710 HT = 40 -  LEN (A$) / 2: POKE 1403,HT: PRINT
      A$: RETURN
5720  REM  ERROR HANDLING ROUTINES
5730 ER =  PEEK (222):EL =  PEEK (218) +  PEEK
      (219) * 256: PRINT  CHR$ (4)"CLOSE": POKE
      216,0
5740  IF ER = 6 AND CH = 1 THEN 5880
5750  IF ER = 6 AND CH = 2 THEN 5890
5760  TEXT : HOME : VTAB 12: PRINT  CHR$ (7)
5770  IF ER = 4 THEN  PRINT "DISK IS WRITE PR
      OTECTED!": GOTO 5860
5780  IF ER = 5 THEN  PRINT "DATA BASE FILE I
      S DAMAGED!": GOTO 5860
5790  IF ER = 6 THEN  PRINT "PATH NOT FOUND!"
      : GOTO 5860
5800  IF ER = 8 THEN  PRINT "I/O ERROR!": GOTO
      5860
5810  IF ER = 9 THEN  PRINT "DISK IS FULL. MO
      VE PROGRAM AND MESSAGE.BASE FILE TO A NE
      W DISK!": GOTO 5860
5820  IF ER = 10 THEN  PRINT "DATA BASE FILES
       ARE LOCKED!": GOTO 5860
5830  IF ER = 11 OR ER = 16 THEN  PRINT "SYNT
      AX ERROR IN LINE "EL".": GOTO 5860
5840  IF ER = 21 THEN  PRINT D$"CLOSE": PRINT
      D$"PREFIX"PR$: RESTORE : GOTO 950
5850  PRINT "ERROR #"ER" HAS OCCURRED IN LINE
       "EL". PLEASE REFER TO YOUR APPLESOFT OR
      ": PRINT "PRODOS MANUAL.": PRINT D$"CLOS
      E": PRINT D$"PREFIX"PR$: END
5860  PRINT : PRINT "INSERT YOUR DISK AND PRE
      SS RETURN.": ONERR  GOTO 5730
5870  GET A$: PRINT A$: PRINT D$"PREFIX"PR$: RESTORE
      : GOTO 950
```

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CIRCLE NUMBER 19

LISTING 1: MESSAGE CENTER *(continued)*

```
5880  HOME : VTAB 12: PRINT "THIS PROGRAM REQ
     UIRES THE PRODOS RAM DISK, /RAM.": PRINT
     D$"PREFIX"PR$: END
5890  PRINT D$"OPEN MESSAGE.BASE,L575": PRINT
     D$"WRITE MESSAGE.BASE,R0": PRINT 0: PRINT
     D$"CLOSE": GOTO 930
5900  IF  PEEK (64448) <  > 234 THEN  INVERSE
     : PRINT " ";: NORMAL
5910  RETURN
```

END OF LISTING 1

KEY PERFECT 5.0
RUN ON
MESSAGE.CENTER

CODE-5.0	LINE# - LINE#	CODE-4.0
89F5CAD0	10 - 100	710E
36C3BA36	110 - 200	A384
35B51C75	210 - 300	615A
8B7092B2	310 - 400	ADD4
13DA04E5	410 - 500	69EA
13E217BE	510 - 600	7FFE
1A7B4392	610 - 700	6BE9
8733BFFC	710 - 800	8C13
F1AE19D7	810 - 900	B1B4
AC893A4A	910 - 1000	B8DE
A2502719	1010 - 1100	B4DF
C2E805E5	1110 - 1200	A07E
49489FD0	1210 - 1300	ADBB
5734D722	1310 - 1400	AF7E
F413CDDE	1410 - 1500	8056
F0193943	1510 - 1600	B38D
BC27ED4A	1610 - 1700	817B
1404AB27	1710 - 1800	A5A2
57F5CBFE	1810 - 1900	AB05
1E514E79	1910 - 2000	8802
27F3F345	2010 - 2100	A942
17447958	2110 - 2200	9054
B021CAF5	2210 - 2300	D54C
D6A96A91	2310 - 2400	73E5
F5171856	2410 - 2500	98AE
48C372C8	2510 - 2600	81B8
53998248	2610 - 2700	5E1B
CFA4BB7D	2710 - 2800	81CF
B2C60C4C	2810 - 2900	829B
2B3B684A	2910 - 3000	9474
8C3A837E	3010 - 3100	9960
163393D0	3110 - 3200	D35A
2CF7E864	3210 - 3300	9F02
5E7E8365	3310 - 3400	83B4
FFA4227C	3410 - 3500	B2F6
74DACACB	3510 - 3600	9CE1
52A33C0D	3610 - 3700	C013
F5E6ED20	3710 - 3800	A6EC
ABF0DF5A	3810 - 3900	892E
EB3162A9	3910 - 4000	A939
70E6F655	4010 - 4100	8C1D
19FABDC6	4110 - 4200	958D
79BB26BD	4210 - 4300	BB90
132D5A33	4310 - 4400	7C0B
9FE34E52	4410 - 4500	711A
1E87246D	4510 - 4600	A72F
4D4070AD	4610 - 4700	9170
10156AB4	4710 - 4800	D6E2
50A60073	4810 - 4900	83FC
83690856	4910 - 5000	DC19
A30FD1AB	5010 - 5100	942E
BF5ED0F2	5110 - 5200	E3EA
7B7E486D	5210 - 5300	BDEB
B5CE64E2	5310 - 5400	B006
1D3477FD	5410 - 5500	A271
CFC0370B	5510 - 5600	A341
BDC0106B	5610 - 5700	F4EE
A275A3F7	5710 - 5800	93C0
2ECB1D79	5810 - 5900	011516
A3FEF0A1	5910 - 5910	C8
C342E68E	= PROGRAM TOTAL =	4E0F

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PREPARED OCTOBER 1987 PRICES SUBJECT TO CHANGE (#88-01)

CIRCLE NUMBER 10

Reviewed by Owen Linzmayer

PICTURE THIS: A COMPARISON OF SCANNERS

Use one of these packages to produce high-quality images from photographs without the use of video cameras or VCRs.

As more and more people use their Apple IIs for desktop publishing, they demand more realistic art, but most clip art collections are just line drawings and simple graphics. If you want real-life images, you must capture them yourself with a digitizer. This review focuses on ThunderScan and Scannit, two low-cost optical digitizers that can scan printed documents and display the result on the graphics screen. With the help of a telecommunications package, these products can virtually transform your Apple II and printer into a poor man's FAX (facsimile) machine.

WHY DIGITIZE?

As you probably know, personal computers process information in the form of numbers: — ones and zeros, to be exact. You may be processing words or painting pixels, but the computer operates with numbers alone, not letters or brush strokes. Since little of what we encounter in our world comes prepackaged in numeric form, this presents a problem. Hauntingly beautiful passages of music can be dissected into sine waves, and the greatest art masterpieces can be seen as surfaces that reflect patterned light waves the human brain finds visually appealing. But if we want to manipulate sounds or images, we must first find a method of translating their analog wave components into discrete pieces of information (ones and zeros). This is exactly what is accomplished with a digitizer.

As the name implies, a digitizer is a hardware device that analyzes a continuous stream of information, such as a sound or light wave, and breaks it down into discrete, digital values. In numeric form, the information is easily manipulated by the computer's processor. Many computer owners are familiar with the type of digitizer that allows the user to convert standard video signals into graphic displays. (See the review of ComputerEyes/2 on page 39 in *Nibble* (Vol. 8, No. 4). Such a device, however, requires additional, expensive video hardware (camera, cassette recorder, or disc player). ThunderScan and Scannit are two optical scanning devices that allow you to easily transfer printed images from the ImageWriter platen to the Apple II graphics screen.

Owen Linzmayer, 16 Trowbridge Rd., Morris Plains, NJ 07950.

THUNDERSCAN

ThunderScan has been available for the Macintosh for several years, and has only recently been converted for use on the venerable Apple II family of computers. ThunderScan was one of the first optical scanners for the Mac and quickly became the *de facto* standard, thanks to its elegant design, sophisticated software, and ease of use. After carefully evaluating ThunderScan for the Apple II, I can say without reservation that it's every bit as good as the Mac version. The ThunderScan package includes software, a digitizing cartridge, and an excellent 72-page user's guide.

The ThunderScan scanner resembles an ImageWriter ribbon cartridge with a 66-inch cable attached. The optical "eye" of the scanner is in the nose of the cartridge. To install the scanner, simply replace the ribbon cartridge with the digitizing cartridge, and then plug the cable into the 9-pin joystick port on the back of the computer. For best performance when scanning a picture, white edge-sensing tape should be applied to the left edge of the printer platen. This .25-inch wide tape doesn't interfere with the proper operation of the ImageWriter when printing, and should not be removed after installation.

If you are using an original or wide-carriage ImageWriter, you must operate the scanner with the printer cover removed. You can trick the printer into thinking that the cover is present by using the provided plastic scan key, which contains a magnet. A special cover that can be used while printing and scanning is available separately

Original Photograph



ThunderScan Scan



Scannit Scan



from Thunderware. ImageWriter II owners don't need to use the scan key, but must remove the smoked plastic lid from their printer covers to allow the scanner cable to move freely. The user's guide recommends that you secure the cable with pieces of self-adhesive Velcro to keep it in place while scanning, but this is unnecessary.

The ThunderScan package comes with both 5.25-inch and 3.5-inch ProDOS disks, neither of which is copy-protected. After booting, the main menu appears. The first time you use ThunderScan, you should configure the software for your system by telling it what type of printer you are using and the slot in which it's located. Once that's done, you can begin a new scan from the main menu.

Before scanning, you must tell the software what to scan and how. This is done on the scan select screen, which is the control panel for scanning. You can tell ThunderScan the area of the original document to scan, how to show the image on the screen, where to save it, and much more. On the right-hand side of the scan select screen is a Hi-Res page map representing the original document to be scanned. Original documents as large as 7.5 by 8.5 inches may be scanned, although you may not be able to display the entire image on the screen at one time. Using the arrow keys, you enclose the area of the original to be scanned in a solid rectangle. Then you choose the area to be displayed on the screen by enclosing it in a dotted rectangle. You can magnify a portion of the original when it is displayed by choosing a smaller display area than the scan area.

To install ThunderScan, simply replace the ribbon cartridge with the digitizing cartridge, and then plug the cable into the joystick port.

On the bottom of the screen are options that control how the scan is to be displayed. The Format option determines which Hi-Res screen is used. On the Apple IIc and IIe, only Hi-Res and Double Hi-Res formats are available. The IIGS has Ultra-Res and Super-Res as well. A special format is available for changing the hard copy size of an image. Each format shows a different number of gray shades, from 2 (black and white) up to 16. Although only the IIGS is capable of displaying true gray shades, you can assign colors to each of the different shades of gray to create interesting effects in the Double Hi-Res format on the IIe and IIc. Images scanned in the Super-Res (320 × 200 pixels) format on the IIGS approach photographic quality using 16 shades of gray.

The Mode option determines how the image will appear on the screen. There are four modes: halftone, line art, grays, and colors. Since the IIe and IIc can't display true gray scales, the halftone mode uses black-and-white dots to represent different shades of gray on the screen. In the line art mode, images appear in high contrast. Some formats allow the display of actual shades of gray on the screen using the grays mode. When used with a color monitor, all formats except Hi-Res and Special can depict shades of gray as colors. You can choose which colors will represent which shades by using the filter feature.

Two other options to be set in the scan select screen are Edge and Scan quality. Setting the Edge quality to rough (as opposed to even) is important when you are scanning a document with ragged edges, or if you don't have edge-sensing tape installed in your printer. The Scan quality determines how accurately the scan proceeds. Although the higher quality yields the best results, it's considerably slower than normal. When all of the options have been set on the scan select

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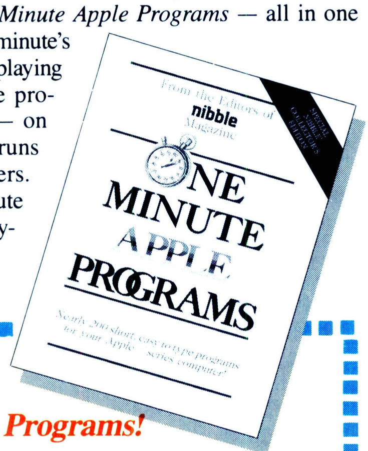
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screen, all that's left to do is focus the scanner. Position the nose of the scanner over the whitest part of your document and turn the scanning cartridge knob so that the number displayed on the focus screen reaches its highest value. After this initial setting, you won't need to adjust the focus knob again. Once that's done, simply position the document in the printer and begin the scan.

It's important to distinguish between what is scanned and what is displayed on the screen. No matter what format and mode options are chosen, ThunderScan proceeds to scan the designated area of your document uniformly. As the scan proceeds, the actual gray-scale information is saved to a temporary file on disk. At the same time, this information is interpreted by the software and displayed on the screen, taking into account the selected format and mode options.

When a scan is completed, you should save the scan information to disk. You may then choose to display the scanned image from the main menu. Since the actual gray-scale information has been saved, the image can be displayed with different format and mode settings. The software reads the scan file from disk and begins to re-create the image on the screen using the new settings. Since the computer must read the scan information file each time you want to display an image, it's a good idea to use a RAM disk to eliminate time-consuming disk access during the scan and subsequent displays.

As the screen is filled in, a line at a time, you can adjust the brightness and contrast for best results. This is accomplished by pressing either the B key or the C key, respectively, and then using the arrow keys to increase or decrease the value. To see the effect of the change, press Return, and the display will continue with the new values. When the display is complete, you may save the screen image to disk for use with commercial paint programs. ThunderScan comes with a built-in printing option that allows you to generate hard copies in two different dots-per-inch (dpi) settings.

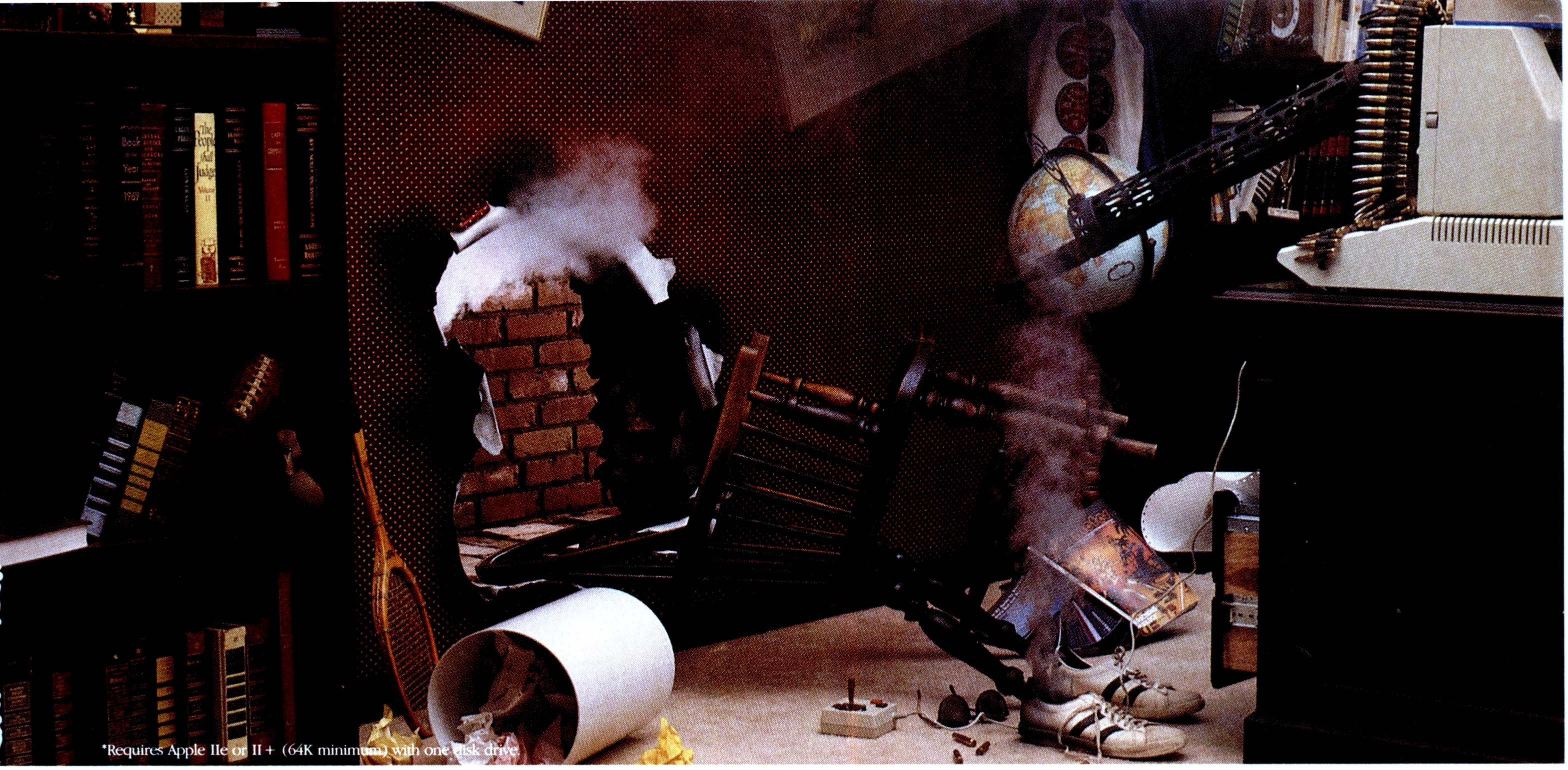
SCANNIT

Available from JED design of Canton, Ohio, the Scannit package contains an imaging device, mounting bracket, two Allen wrenches, a single 5.25-inch disk and a user's guide. Scannit also comes with 16 pages of documentation in a clear plastic binder.

To install the imaging device, the small metal bracket must first be mounted onto the printhead. Once installed, this bracket may remain in place since it does not interfere with the normal operation

TABLE 1: Scanner Features Compared

	ThunderScan	Scannit
Computers	IIc, IIe, IIGS	IIc, IIe
Format	5.25-, 3.5-inch disks	5.25-inch disk
ImageWriter I/II	X	X
Print option	X	
Documentation	72 pages	16 pages
Modes: Hi-Res	X	X
Double Hi-Res	X	X
Super-Res	X	
Ultra-Res	X	
Special	X	
Variable scan quality	X	
Magnification option	X	X
Halftone	X	X
Line art	X	
Gray scale	X	
Pseudo-color	X	
Brightness/contrast control	software	hardware
Maximum document size	7.5 × 8.5 inches	8.375 × 6.625 inches
Save screen option	X	X
Save scan option	X	
RAM disk compatible	X	

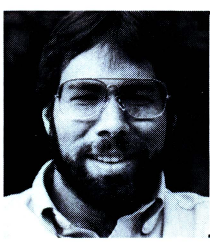


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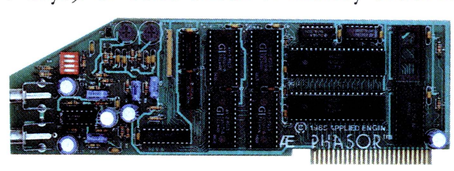
Steve Wozniak, the creator of Apple Computer

What's best, the Phasor works with more off-the-shelf software than any other sound card you can buy. So now all your favorite games — like Skyfox™, Under Fire™, Willy Byte™, Tactical Armor Command™, Maze Craze™, Zaxxon™ and Ultima IV™ — can have shattering sound effects. Educational packages like Music Construction Set™, Guitar Master™ and Music Star™ are also dramatically enhanced.

The Phasor has *four times* the output power and *twice* the accuracy of any other sound card — but of course, you can easily turn down the volume if you need a rest. The Phasor is equipped with 12 simultaneous sound channels, 4 white noise generators, and a voice channel expandable to 2 voices. Programs written for other sound cards, including Mockingboard™, ALF music card™, Symphonix™ and the Super Music Synthesizer™, sound even better with the Phasor. And you can control speech, pitch, volume and more with simple commands.

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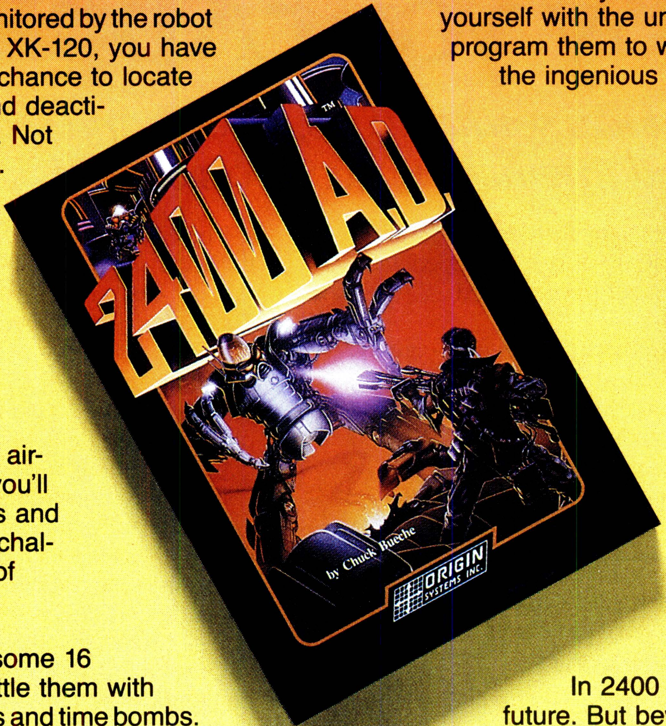
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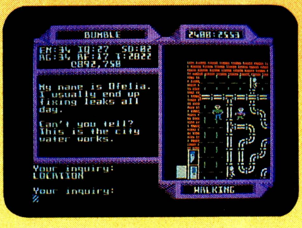
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CIRCLE NUMBER 11

of the printer. Different printers require different mounting brackets, so make sure you specify printer type when ordering Scannit. JED design currently offers mounting brackets for ImageWriters I and II.

The optical imaging device is encased in a clear plastic housing, which slides onto the mounting bracket. A thin 52-inch wire runs from the imaging device to a small white box, which contains additional electronics. On the front of this control unit are an on/off toggle switch, level and contrast knobs, and indicator lights for both power and signal transmissions.

A thicker, 44-inch cable from the back of the control unit should be attached to the joystick port of the computer. Since the control unit draws its power from the joystick port, a separate transformer is not required. When you're not using Scannit, remember to turn off the control unit, or the computer will execute a self-test cycle when rebooted.

The system software is provided on a single, unprotected 5.25-inch ProDOS disk. When booted, the main menu appears, allowing you to read on-line instructions, focus the imaging device, scan a document, or display previously saved images. The first time you use Scannit, you must focus the optical imaging device. Use the provided wrench to turn the Allen screw in the back of the scanner so that the number displayed on the focus screen reaches its highest value. Each time you move the mounting bracket, you must readjust the focus.

Make sure that you have a ProDOS volume available with enough free space to save a screen image (33 blocks for a Double Hi-Res picture) before beginning a scan. When you're ready to scan a document, the software pauses while you position it in the printer. To prevent accidental damage to the original, the documentation recommends that you use photocopies. Also, if the document is smaller than 8 × 10 inches, it should be securely taped to a full-size sheet of tractor-feed paper. Scannit is limited to reproducing documents no larger than approximately 8.375 × 6.625 inches.

Scannit is capable of producing both Hi-Res and Double Hi-Res images. As the imaging device zips along the printer platen, a picture begins to fill the screen. The current Hi-Res mode and magnification scale are displayed in the text window at the bottom of the screen, and you can alter the picture with hardware or software adjustments. The level knob on the control box, analogous to ThunderScan's brightness control, determines sensitivity to white. The contrast knob, on the other hand, adjusts the range of half-toning. For instance, if the document is predominantly black and white, such as a line drawing or a page of text, the contrast knob should be turned counterclockwise. Each document will require different settings for the best results.

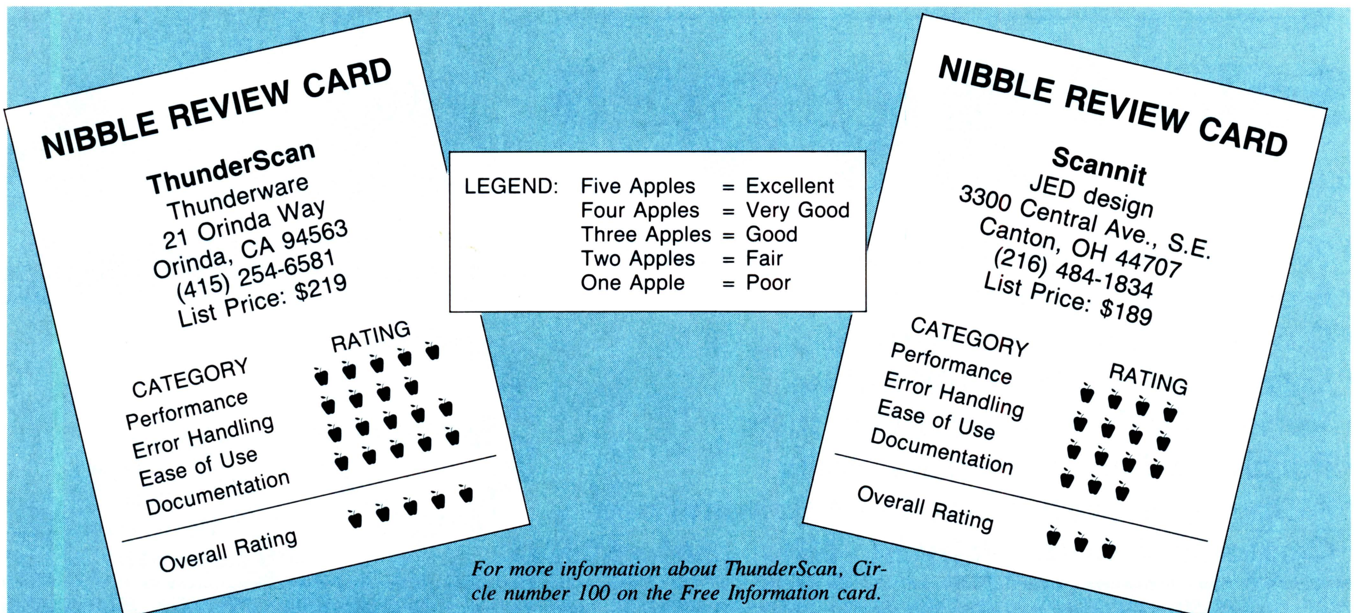
In addition to hardware adjustments, you can also adjust the scanner using software controls. Using the Left- and Right-Arrow keys, you can center the image on the screen. The plus (+) and minus (−) keys allow for more precise positioning. Also, by pressing a number between 1 and 5, you can change the level of magnification appropriately. These functions are helpful if you're only interested in scanning a small area of a large document. If you press the R key, the screen is cleared and the scan restarts with the newly adjusted magnification and position values.

A full Double Hi-Res scan takes under four minutes to complete, and when it's finished you have the option of saving the screen to disk. Unlike ThunderScan, which can save both scan information and screen displays, the Scannit software saves only the final graphics screen. Once saved, these screens may be loaded into commercial paint programs, such as MousePaint (Hi-Res) or Broderbund's Dazzle Draw (Double Hi-Res), for further refinement and printing. Available in the main menu, the gallery option allows you to load and view a previously scanned image. The disk also contains a program that will convert Double Hi-Res images for use with Beagle Bros products (which use a unique file format). To use scanned images under DOS 3.3 applications such as Baudville's Prince, you must convert them with the Apple ProDOS system utilities.

SUMMARY

Both ThunderScan and Scannit perform the same task: optically digitizing printed documents for display on Apple II Hi-Res screens. However, their approaches are radically different. ThunderScan software is more sophisticated than Scannit's program while Scannit offers the benefits of simplicity. Scannit generates only graphics screens, while ThunderScan produces additional gray-scale information files. With ThunderScan, brightness and contrast can be manipulated smoothly after a scan is completed. In contrast, Scannit requires a new scan for adjustment of brightness and contrast. Designating the areas to be scanned and displayed is extremely easy using ThunderScan's scan select screen, whereas a trial-and-error approach is required with Scannit. Although the end results are comparable (see **Figures 1-3**), ThunderScan is easy to use and wins hands down.

ThunderScan's documentation is vastly superior. The user's guide is 72 pages, professionally typeset and bound, and contains an abundance of screen shots, examples, detailed explanations, and a complete index. (See **Table 1** for a comparison of both units.) As it stands, ThunderScan is the superior value and gets my highest recommendation.



For more information about ThunderScan, Circle number 100 on the Free Information card.

For more information about Scannit, Circle number 101 on the Free Information card.

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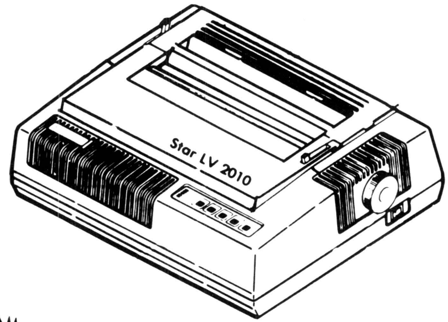
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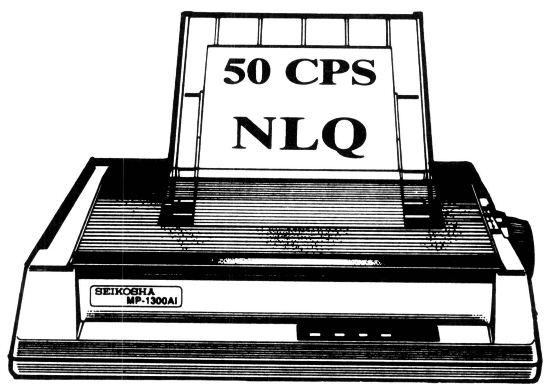
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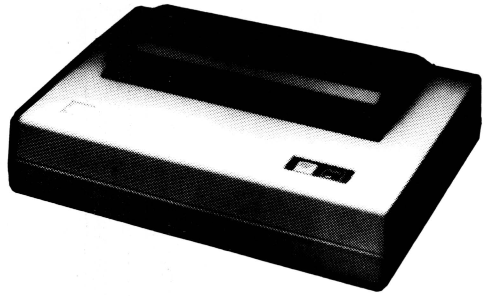
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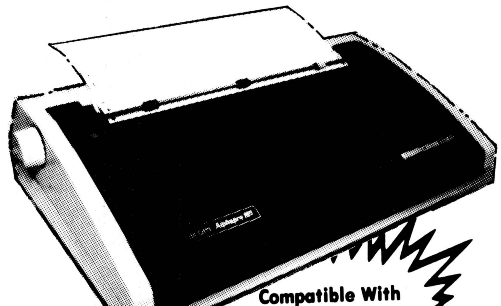
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CIRCLE NUMBER 12

by R.A. Dousette

NET PRESENT VALUE MADE EASY

Learn how to use AppleWorks' powerful @NPV function to compute net present value and more, such as internal rate of return and the duration of an investment.

Although many people use AppleWorks for financial management, the program has only one function specifically designed for financial calculation: @NPV, for net present value — the amount of money you need now to receive a specific return on your investment for a given period of time and interest rate.

If used correctly, however, the @NPV function can also be used to calculate other data, like internal rate of return. These techniques also apply to any spreadsheet program with a limited range of financial functions.

PRESENT VALUES AND INTEREST RATES

Compound interest is based on the idea that the value of money depends not only on the amount, but also on the time when the money is available. Suppose that someone offers you a choice between two payments, either $250 or $1,000. If everything else is equal, you would be foolish to choose the $250. What if the $250 is available immediately while the $1,000 would be paid to you a year from now? Under most circumstances, the offer of $1,000 is the better choice, because $250 invested at interest would not grow to $1,000 — even in several years. But suppose the $1,000 payment were available 20 years from now, and you expect to be able to invest your money at 8% per year over the next 20 years. The $250 payment will accumulate to $1,165 in 20 years, so the $250 seems more valuable than the $1,000. The $1,165 can be referred to as the future value of $250. The payment today that's equivalent to $1,000 in 20 years is $215 at 8%. The $215 can be referred to as the present value, or the discounted value, of $1,000.

How do we get values of money at different times? First, you need an interest rate. The rate chosen might be the amount you earn on a savings account, or the amount earned on a mutual fund. You might also choose the rate you pay on borrowed money, for example, the rate on your home mortgage or your credit card balance. If you participate in an extremely risky investment, you'll probably expect a higher rate of return than any of the interest rates mentioned here. And if you prefer immediate gratification over deferred, then a high interest rate will make you save; you'll be more willing to pay high rates to get money into your hands today.

As an example, suppose someone owes you $1,000 and this amount will be paid to you a year from now. What's it worth to you today? Assuming that the debtor is reliable, there's little doubt that you'll be paid. If you can earn 8% on a safe investment of comparable risk, you might use this to get the present value of the $1,000; it turns out that $925.93 is the amount today that will grow to $1,000 in one year at 8% interest. Thus, the discounted value to you of the promise to pay $1,000 a year from now is $925.93.

Now let's change this example slightly. Perhaps the $1,000 is owed to you by your brother-in-law who has a poor track record for paying debts on time. In view of this, you assign a lower value to his promise. One method of measuring this risk is to use a higher interest rate to get the present value. If your concern is worth an extra 12% of yield, then the present value becomes $833.33. At 20% this amount will grow to $1,000 a year from now.

Finally, let's assume that you need the money immediately. Your brother-in-law isn't able to pay you $1,000, $925.93 or $833.33, so you settle the debt for an immediate payment of $769.23. At 30% interest, this amount will grow to $1,000 in one year. The additional 10% increase in the rate represents the amount you're willing to forfeit in order to receive the money today.

Setting an interest rate will quite likely be one of the most difficult parts of any financial decision you make. No formulas are available to guide you. You must rely on your own analysis, insight, and good judgment.

Once you've selected an interest rate, present values can be determined easily. If the interest rate is 15% per year, for instance, then amounts due in the future can be discounted to the present. Simply divide them by 1.15 for each year until the payment is due. If $1,000 is due one year from now, the present value is given by:

```
$1,000/1.15=$869.57
```

If $1,500 is due two years from now, the present value is given by:

```
$1,500/(1.15^2)=$1,134.22
```

Similarly, if $2,500 is due three years from now, if $2,000 is due four years from now, and $1,000 is due five years from now, their present values are:

```
$2,500/(1.15^3)=$1,643.79
$2,000/(1.15^4)=$1,143.51
$1,000/(1.15^5)=$497.18
```

If these five payments represent the returns, or cash flows, on an

R.A. Dousette, 1912 Green Mountain Dr., Apt. 121m, Little Rock, AR 72212. Net Present Value requires AppleWorks.

investment, then the present value of the payments is given by totaling the five numbers (see **Table 1**).

At 15% interest, the present value of the investment is $5,288.25. (This amount is two cents less than the sum of the amounts in **Table 1** due to errors in rounding to the nearest hundredth.) Here's another way to describe this: If you invest $5,288.27 and get these returns over the next five years, the yield on your investment is 15%.

This example is taken from the old VisiCalc tutorial to introduce the @NPV function. The values represent the cash flows generated by a $5,000 investment; their discounted value is calculated using different interest rates to get the return on the investment.

EXAMPLE 1: Net Present Value Screen

	A	B	C	D	E	F
1	Year	1	2	3	4	5
2	Principle	1000	1500	2500	2000	1000
3	Interest	.15				
4	NPV=	5288.25				
5						
6	Flow*Yr	1000.00	3000.00	7500.00	8000.00	5000.00
7	Prod. NPV	15129.27				
8	Duration	2.8609208				
9						
10	Cost	-5000				
11	Interest	.0219107				
12	IRR	.1719107				

The total of $5,288.25 is the amount calculated by the @NPV function. To verify this, enter the following commands into a new AppleWorks spreadsheet.

Enter the labels (as in **Example 1**):

```
A1: Year
A2: Principle
A3: Interest
A4: NPV=
```

Enter the following values for each cell:

```
B1: 1
C1: 2
D1: 3
E1: 4
F1: 5
B2: 1000
C2: 1500
D2: 2500
E2: 2000
F2: 1000
B3: 0.15
```

Enter the formula:

```
B4: @NPV(B3,B2...F2)
```

If entered correctly, cell B4 should show the same results as in **Table 1** after recalculating. The @NPV function performs the same function as our example, that is, each amount is taken and discounted at the interest rate specified in A3, and then the discounted amounts are totaled. If you're entering this example into AppleWorks while reading this article, don't clear it out, because I'll refer to it again later.

Let's use these five cash flows to represent the returns on a $5,000 investment. If you're willing to settle for a 15% return on this investment, then you've gotten a bargain, indeed; you've paid $5,000 for a series of payments worth $5,288.25. The extra $288.25 represents an additional yield; we'll see later that this particular investment returns about 17.19%.

It's important to realize that the @NPV function assumes that payments are discounted from the end of each period, but in many cases, the payments are made at the beginning of the period. If you have 50 payments to discount, and if A1 contains the interest rate and B1 through B50 contain the payments, the present value is given by the formula:

```
@NPV(A1,B1...B50)
```

if the payments are made at the end of each period. If, however, the payments are made at the beginning of each period, then the present value is given by the expression:

```
+B1+@NPV(A1,B2...B50)
```

The second formula allows for one less period of discounting.

Duration

Duration is an important concept in certain kinds of investment analyses, and one that will be used to determine the internal rate of return. If only one repayment is involved, duration is easy to define; it's simply the period of time until the investment is repaid. Consider the example of your brother-in-law. If he repays the loan in one year, then the investment's duration is one year. If he delays repayment by an additional year and six months, the investment's duration is two and one half years. If you buy a bond that matures in twenty years, then the bond's duration is twenty years.

Now let's complicate things a bit. Suppose that you make an investment that's to be repaid in two payments, $1,000 a year from now and $2,000 two years from now. What's the duration? One guess would be to average the durations of the two payments, which means the duration of the investment is one and a half years. What if the investment were to be repaid by a payment of $2,000 one year from now and $1,000 two years from now? By our logic, the duration would still be one year and a half, even though the second investment is repaid a lot faster than the first.

The solution is to define the duration of the investment as the weighted average of the payments' durations where the weighting factor is the present value of the corresponding payments. Here's an example. Since we're talking about present values, we'll need an interest rate. **Table 2** uses 12% interest and the first investment ($1,000) from the preceding paragraph.

The duration is equal to $4,081.64 divided by $2,487.25, that is, 1.64 years. If the first payment is $2,000 and the second is $1,000, you can create your own table to verify that the duration is 1.31 years.

TABLE 1: Present Value

Year	Present Value
1	$869.57
2	$1,134.22
3	$1,643.79
4	$1,143.51
5	$497.18
Total	$5,288.27

TABLE 2: Duration

Payment Duration	Payment Amount	Present Value	Weight times Duration
1	$1,000	$892.86	$892.86
2	$2,000	$1,594.39	$3,188.78
Total	$3,000	$2,487.25	$4,081.64

Returning to the example that we've entered, the investment's duration can be calculated by entering the following commands:
Enter the labels:

```
A6: Flow * Yr
A7: Prod. NPV
A8: Duration
```

Enter the formulas:

```
B6: +B$*B2
B7: @NPV(B3,B6...F6)
B8: +B7/B4
```

Copy B6 into C6 through F6, keeping all values relative.

Row 6 will multiply each cash flow by its duration. Cell B7 calculates the present value of the products, and cell B8 calculates the duration of the cash flows. By entering different values in cell B3, you can see that the duration changes depending on the interest rate chosen. If an interest rate of 12.5% is contained in B3, the worksheet should show a duration of 2.893 in cell B8; changing the interest rate to 15% will lower the duration to 2.861.

The duration figure is useful because it measures the sensitivity, or volatility, of an investment's value to interest rate changes. Large durations indicate an investment that will change value considerably with a change in interest rates; a shorter duration indicates less sensitivity to interest rate fluctuations. The following is an approximate formula that predicts the change in value:

```
(Value Change)= -(Value)*(Duration)*(Interest
Change)/(1+interest)
```

For example, if you pay $20,000 for a bond with a duration of 12 years, and if interest rates increase from 12% to 14%, you can expect the bond to change in value by the amount:

```
-$2Ø,ØØØ*(12)*(.Ø2)/1.12= -$4,285.71
```

This means a 2% increase in interest rates could destroy over 20% of the market value of your bond! If the duration were three years, your investment would lose approximately $1,071.43 with the same increase in interest rates. By choosing shorter durations your investments will be relatively safe from fluctuations in value, either up or down.

INTERNAL RATE OF RETURN

Let's return to our example of the five cash flows. The present value of these cash flows at 15% interest is $5,288.27. If we invest $5,288.27 and get these cash flows as the return on our investment, our return is 15% per year. This 15% figure is also referred to as the *internal rate of return*. But what if the investment costs us $5,000? This lower price means that we've got a higher return on our investment. If we'd paid $5,500 for it, then our return would be less than the 15%.

This section will present a method for finding the internal rate of return on an investment. Since there isn't any simple formula that we can use to calculate the return, we have to use an interative process by recalculating the worksheet until the internal rate of return is determined. The worksheet uses forward reference to determine a new interest rate that is then used to recalculate the present values. Like estimating square roots, the worksheet should quickly converge to an acceptable degree of accuracy.

As an example, let's consider the payment of $5,000 for the cash flows in our worksheet. From our previous work, we know that the present value of the cash flows at 15% is $5,288.27. We also know that the duration of the investment is 2.861, and we want to change the interest rate by an amount such that the present value will decrease by $288.27. The formula for the value change in the previous section can easily be changed into a formula for the interest change; thus, by a little algebra, we have:

```
(Interest Change)= -(Value Change)*(1+interest)/
((Value)*(Duration))
```

Substituting in our known values, we have:

```
(Interest Change)= -(-$288.27)*1.15/($5,288.27*
2.861)
(Interest Change)=2.1911%
```

This tells us that we should increase the yield rate to 17.1911%. This is an approximation, however, and the net present value will not exactly equal $5,000. To get a more exact number, we must recalculate the present value, the duration, and the value change to get a new interest change. The value changes and the interest changes should quickly become small enough that no further recalculation will be necessary.

Now let's do this in AppleWorks. If you still have the worksheet in memory, enter these additional commands.

Enter the labels:

```
A1Ø: Cost
A11: Interest
A12: IRR
```

Enter the values:

```
B3:.15
B1Ø: -5ØØØ
```

Enter the formulas:

```
B11: +B4+B1Ø*(1+B3)/(B4*B8)
B12: +B3+B11
B3:  +B12
```

The entry in cell B10 contains the price paid for the investment. This amount is shown as a negative number, because it's a cash flow in the "opposite direction," that is, it's an amount you pay rather than an amount paid to you. The entry in B11 first calculates the value change as +B4+B10, and then uses the formula to determine the interest change. The entry in B12 determines the new rate by incrementing the yield in B3 by the change contained in B11. Finally, forward reference is provided by the entry in B3. This entry transfers the rate in B12 back to B3, and then recalculates the entire worksheet. By entering Open-Apple-K three or four times, you should see the value in B3 converge to one value; if you set the column width to at least eight characters, you'll see a return of 17.28674%. After iteration this same number will be shown in B12, indicating that the worksheet has converged. By changing the value in B10 to −5500, and then pressing Open-Apple-K three or four times, you'll see that the yield is 13.43802%. This is the internal rate of return if $5,500 is paid for the investment.

This is usually an efficient method of finding an investment's internal rate of return. In some unusual cases, it may not converge,

continued on page 51

TABLE 3: Formulas

Present Value of Payments Made at the End of Each Period:

@NPV Form:	@NPV(B1,A1...A*n*)
Formula:	+A1*(1−(1/(1+B1) ^ C1)/B1)

Present Value of Payments Made at the Beginning of Each Period:

@NPV Form:	+A1+@NPV(B1,A2...A*n*)
Formula:	+A1*(1−(1/(1+B1) ^ C1)*(1+B1)/B1)

Duration of Payments Made at the End of Each Period:

Formula:	1−(1/(1+B1) ^ C1*((1+B1)/B1−(1/(1+B1) ^ C1 *C1)/(1−(1/(1+B1)C1))

Duration of Payments Made at the Beginning of Each Period:

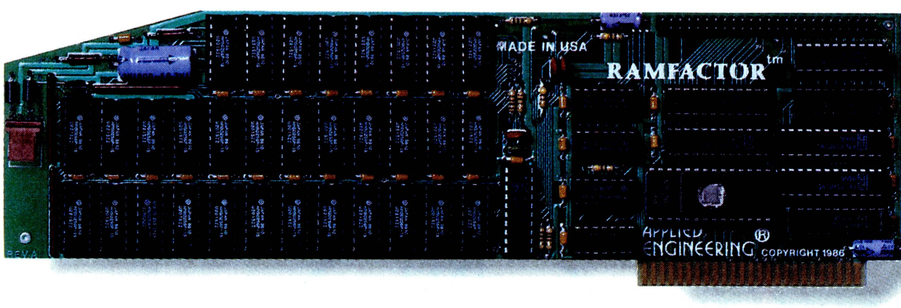
Formula:	1−(1/(1+B1) ^ C1*((1+B1)/B1−(1/(1+B1) ^ C1 *C1)/(1−(1/(1+B1)C1))−1

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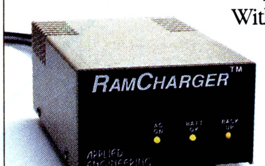
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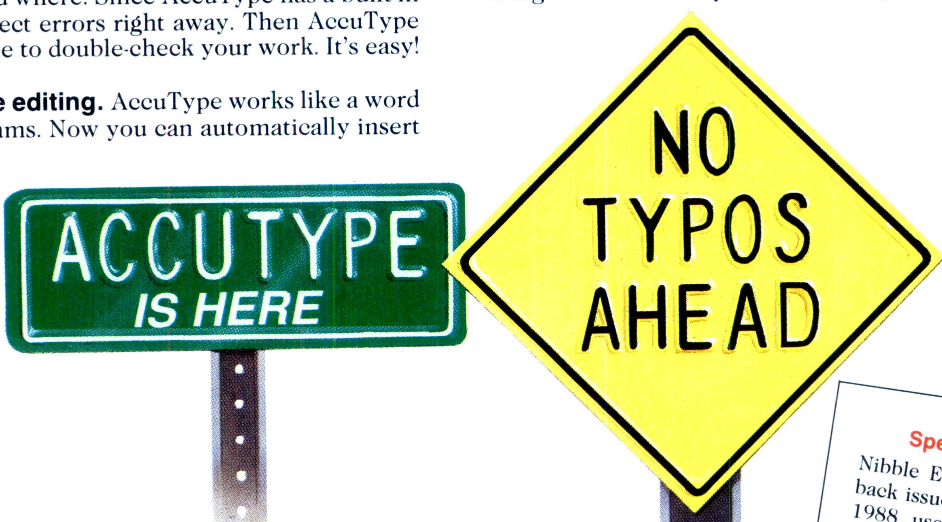
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in which case you'll have to resort to another method beyond the scope of this article.

CALCULATING EFFICIENTLY

At this point, you should be able to use the @NPV function for calculating present values and internal rates of return. But do you really want to do this for all possible applications? There are certain applications where the @NPV function can be replaced easily by a formula. In particular, if all the cash flows are the same, then certain formulas can be used to simplify the spreadsheets. If you're using the @NPV function extensively, then using the formulas will produce far more efficient worksheets.

Let's assume that you have *n* cash flows, and that they're all the same and stored in cells A1 through A*n*. The interest rate is contained in B1 and the value of *n* is contained in C1. The formulas shown in **Table 3**, based on A1, B1 and C1 only, can be used in place of the @NPV formulas.

When you're evaluating a spreadsheet, these formulas can save you time. For example, suppose you're managing a small business, and you need to borrow as much money as possible to finance an expansion of your operation. After some analysis, you determine that you can afford to pay $1,000 a month toward repayment of the loan. How much money can you afford to borrow?

One method is to enter all the payments in the AppleWorks spreadsheet and use @NPV to calculate the present value of the payments. If you're following along with your spreadsheet program, enter the following in a new spreadsheet:

1. A1:1000
2. Copy A1 into A2 through A240. (With the cursor on A1 press Open-Apple-C, W, Return, Down-Arrow, period, then repeat Open-Apple-Down Arrow until cell A240 is highlighted and press Return.)
3. B1:.01
4. C1:240
5. B2:@NPV(B1,A1...A240)

The first and second commands enter the monthly payment into cells A1-A240. Cell B1 contains the interest rate of 1% per month and C1 contains the number of payments. The @NPV command in B2 calculates a present value of $90,819.41 as your credit line if the bank charges you 1% interest per month. By entering an interest rate of 1.5% in B1, you can see that an increase in monthly interest rates of .5% would cut your credit limit to $64,795.73! An increase of interest rates from 12% per year to 18% per year will chop 40% off the amount that you can afford to borrow.

Now let's do the same worksheet using the formulas. Keep the values entered in A1, B1, and C1, and enter the following:

B2:+A1*(1-(1/(1+B1)^C1)/B1)

This second spreadsheet returns the same value as the first, but only requires four entries instead of the 243 entries required by the other spreadsheet. Although I haven't timed them, I've noticed a perceptible time difference between the two worksheets. The second is quite a bit faster than the first, and this difference is even more apparent if you calculate the duration of this loan. For those who want to try it, the duration is 76.74 months if payments are made at the end of each month.

The methods presented in this article will give you tools that you would ordinarily expect only in more advanced spreadsheet programs. True, you have to iterate a few times to get the internal rate of return, but this seems a small price to pay when compared to buying a new spreadsheet program.

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Here's a disk copy program that uses extra memory to reduce the number of disk swaps.

If you're constantly swapping and copying disks on your single-drive system, or if you've ever destroyed an original disk by accidentally putting it in the wrong drive (or the right drive at the wrong time), then you'll flip over Floppy Copy. It's a simple disk-copying program that will copy any normal (unprotected) DOS 3.3, ProDOS, or Apple Pascal 5.25-inch disk. The program acts like an enhanced version of the copy programs provided by Apple. Floppy Copy runs under DOS 3.3 and requires as little as 48K and one 5.25-inch disk drive.

If you have a 128K or larger Apple (a IIe with an extended 80-column card, a IIGS, or a IIc), just two passes are needed to copy a disk. This is particularly useful when you're copying on single-drive systems. If you have a 64K IIe or II Plus, four passes are required to copy 5.25-inch disk. On a 48K II Plus, five passes are required, as with the CopyA program on the DOS 3.3 System Master. By contrast, the ProDOS copy utility requires ten passes to copy a disk, regardless of how much memory your Apple has.

If you tell Floppy Copy that the disk you're copying onto has already been formatted, it won't waste time reformatting it. Floppy Copy won't copy until it detects a write-protect tab on the disk you're copying, a safeguard against damage from power line problems, electrical storms, computer failure, etc.

On a 64K Apple with two disk drives, Floppy Copy will copy a disk in approximately 70 seconds if formatting is required. This is slightly faster than either CopyA or the ProDOS copy utility. If formatting isn't required, Floppy Copy will copy a disk in approximately 50 seconds. To help you localize disk problems, Floppy Copy will tell you which track was being accessed when an error occurred.

USING THE PROGRAM

To use the program, boot the disk and type:

RUN FLOPPY.COPY

Michael Gruenthal, 1300 Carolina Ave., Durham, NC. Floppy Copy runs under DOS 3.3 only, but it copies ProDOS, DOS 3.3, and Pascal format 5.25-inch disks.

FIGURE 1: Floppy Copy Prompts

```
                    FLOPPY COPY                128K
               BY MICHAEL GRUENTHAL
                COPYRIGHT (C) 1988
                BY MICROSPARC, INC.
                CONCORD, MA 01742

SLOT # OF ORIGINAL DISK (1-7)?                   6
DRIVE # OF ORIGINAL DISK (1-2)?                  1
SLOT # OF COPY(1-7)?                             6
DRIVE # OF COPY(1-2)?                            2

FORMAT COPY DISK (Y/N)??
=> IF UNSURE, PRESS <RETURN><=
=>PRESS ESCAPE TO QUIT<
```

A title screen will appear, and after a few seconds, the amount of memory present in your system will be displayed in the upper-right corner of the screen. You'll then be asked a few questions about the number and location of your disk drive(s). For each question, a preset value (default) will be displayed on the screen. To accept this value, simply press the Return key (or any key outside the range shown on the screen). To change a value, just type in the desired number.

The disk you wish to copy is referred to as the original, while the blank disk you're copying onto is referred to as the copy (this disk doesn't have to be blank, but bear in mind that any information on it will be overwritten during the copying process). The slot number is the slot in which your disk controller card is installed. It's usually slot 6 (always on the Apple IIc). If you have a single-drive system, the slot and drive numbers that you enter for the original must match those entered for the copy.

You'll then be asked if you need to format (initialize) the copy disk. Blank disks must be formatted before data can be stored on them, but if you've already used your copy disk, it may not require reformatting. After you've inserted your disk(s), the copying process will begin. When the program has finished copying your disk, you may wish to copy another one. To do so, simply press Return. Your previous slot and drive assignments will be preserved.

You may cancel the copying process by pressing the Escape key whenever that option is presented, but not while the disk drive is spinning. If you use this option, or if a disk error is encountered from which DOS cannot recover, you'll be asked if you want to try again. Pressing the N key will end the program, while pressing any other key will restart the program (your slot and drive assignments will be preserved, but you'll have the option of changing them). If necessary (that is, if your disk drive is walking across the table), you may cancel the copying process while the drive is spinning by pressing Control-Reset. The program will interpret this as an error and ask if you'd like to try again. Since Floppy Copy traps drive errors very quickly, you really shouldn't have to use the Reset key at all.

ENTERING THE PROGRAM

Start by entering the Applesoft program (**Listing 1**) and saving it with the command:

SAVE FLOPPY.COPY

If you have an assembler, enter the source code from **Listing 2**, save it and assemble it, using FLOPPY.OBJ as the object file name. If you don't have an assembler, enter the object code from **Listing 2** and save it with the command:

BSAVE FLOPPY.OBJ,A$300,L$D0

For help with entering *Nibble* listings, see the Typing Tips section.

HOW THE PROGRAM WORKS

Since Floppy Copy lets DOS 3.3 do most of the work, the program is relatively short. The relevant section of DOS 3.3 that handles the copying is called RWTS (for Read or Write a Track and Sector). The basic idea is that RWTS will read the information from one sector (1/16 of a track), store it in memory, and then write it back out to the same sector of another disk. Unfortunately, the Floppy Copy BASIC program is quite compact and not easily readable because of the large quantity of memory reserved for disk data. You'll note the frequent use of Boolean alternatives to IF. . .THEN statements (e.g., **lines 130 and 540**) in order to use as few lines as possible. If you'd like to pick your way through the program, here's a brief outline to help you along.

The Floppy Copy program looks for available RAM (**lines 120-130**), collects information from you (**lines 140-160**), and then asks you to insert your disk(s) (**lines 170-180**). After checking on the status of write-protect tabs (**lines 470-520**), Floppy Copy tells RWTS to read as many as 18 tracks (288 sectors) into memory before writing this information onto the copy disk. The number of tracks read or written in one pass depends on the amount of memory available. The heart of this process resides in **line 350**. The innermost track (track 34) is read first, and the process is completed when the outermost track (track 0) has been copied. **Lines 360-380** handle your request to quit the program, and **line 400** deals with errors. **Lines 410-460** handle the memory management for 128K systems.

The machine language routines in FLOPPY.OBJ perform mundane tasks like storing or retrieving one track from the RAM card ($306-$312), intercepting DOS errors ($313-$318), and engaging the disk drive to check for a write-protect tab. The remaining routines are used only if 64K of auxiliary memory is present. The routine from $335 to $34F moves bank 2 from the RAM card to auxiliary memory. The routine from $350 to $368 uses the built-in AUXMOVE routine to switch a block of memory at $1700-$9700 between main and auxiliary memory. The direction of this transfer depends on the status of the carry flag. Finally, the routine from $36A to $388 moves a block at $9800-$A900 from auxiliary memory to bank 2 of the RAM card.

The last routine in FLOPPY.OBJ is used with **lines 120 and 130** of Floppy Copy to determine the amount of available RAM. Since you may want to use this routine in your own programs, let's go through it step by step. The easiest test for available RAM is to store some data in a potentially available memory location. If such a location actually exists, reading its contents will reveal the data just stored there. Depending on which Apple II computer is involved, there are two potential areas of additional RAM. In an Apple II Plus, a language card (16K RAM card) may be available, providing an extra 16K of bank-switched RAM. In an Apple IIe, an extended 80-column card may be available, providing an extra 64K of bank-switched RAM. The IIc and IIGS always contain the extra 64K.

If you tell Floppy Copy that the disk you're copying onto has already been formatted, it won't waste time reformatting it.

Line 120 of Floppy Copy uses the well-known S. H. Lam routine to move a copy of the monitor ROM into the language card and then place a test byte ($88) into the first available language card location ($D000). Note that this line assumes the presence of a language card. No harm will arise if one isn't there, but location $D000 obviously will not contain an $88. **Line 130** calls the identify configuration routine in FLOPPY.OBJ, which first checks the signature byte ($FBB3) to distinguish an Apple II Plus from a IIe, IIGS, or IIc. If an Apple II Plus is found, the language card RAM is enabled (again, assuming it's there) and the value stored in location $D000 is compared with the test byte ($88). If $88 is found, then the language card is really there, so the value of the variable LC in **line 130** of Floppy Copy is changed from zero to one.

If an Apple IIe with an 80-column card, a IIc, or a IIGS is found, the same strategy is used. Auxiliary RAM is assumed, a test byte is placed into it, and an attempt is made to retrieve the test byte. The comments in the source code should be sufficient to guide you through this process. If a second 64K bank is found, the value of the variable AUX in **line 130** of Floppy Copy is changed from zero to one. In each case, the amount of RAM detected will be stored in memory location $06.

A few important points must be noted about this routine. Prior to calling it, you must deactivate the 80-column display on the IIe, IIc, or IIGS. This is easily accomplished by the statement "PRINT CHR$(21)" as in **line 80** of Floppy Copy. If the routine is called while in 80-column mode, the display will be scrambled. The routine also requires the presence of the SWAP subroutine ($350-$369), although you may modify SWAP to move a much smaller quantity of data, as is done in **line 130** of Floppy Copy.

CUSTOMIZATION

Since your system configuration probably won't change very often, you may want to modify the program. **Line 80** contains the default slot and drive assignments that are presented when the program is first run. The variables S and D contain the slot and drive assignments for the original disk, and the variables SC and DC contain values for the copy disk. If you have a single-drive system you'll probably want to change the value of DC to one in **line 80.**

Before you make additional changes, remember that Floppy Copy uses memory from $1700 to $9700 to store data, so neither the pro-



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CIRCLE NUMBER 14

Welcome



Open-Apple is Tom Weishaar's monthly newsletter for knowledgeable Apple II users. It's thin but packed tight with Apple II lore, humor, letters, tips, advice, and solutions to *your* problems. Compared to other Apple II publications, ***Open-Apple*** has the highest new-idea-per-issue ratio, the clearest writing, the funniest cartoons, the longest index, the *only* warranty (all your money back if you're not satisfied), and it takes up the least shelf space. The only thing it doesn't have is the most subscribers. Yet.

II cue #29

A *relational data base* keeps data in tables and keeps track of the relationships between data items in different tables using "primary" and "foreign" keys. A primary key is a unique identifier for each row in a table. A foreign key links each row in one table with one row in another table. A relational data base also usually supports SELECT, PROJECT, and JOIN commands for creating new tables out of existing ones. AppleWorks provides a small subset of a relational system—it keeps data in tables and provides a SELECT command. For more information, see "Making AppleWorks Relational" in the June 1987 ***Open-Apple***, pages 3.33-37.

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gram nor its variables may encroach on this region. Feel free to shorten the program, but don't add to it without a thorough understanding of how and where Applesoft uses memory to store variables. As listed, the program occupies memory up to $15F8 while the variables extend up to $16FB. Unfortunately, there's virtually no room (4 bytes) for expansion.

If you love to live dangerously, you may wish to change **line 470** to read RETURN (just like **line 520**), and then delete **lines 480-520**. If you do, Floppy Copy will no longer insist that you put a write-protect tab on your original disk. But don't say I didn't warn you....

THE **JANUARY 1988 DISK** CONTAINS THIS PROGRAM

If you'd rather not type in the listing for this program, you can buy it on disk, complete, free of typos and ready to run. *Nibble*'s January 1988 programs are available on a single disk for an introductory price of $12.95 from *Nibble*, 52 Domino Dr., Concord, MA 01742. Add $2.50 for shipping/handling within the U.S. and Canada; $7.50 for overseas air mail. Introductory price expires 3/31/88; after that date, the price will be $16.95. See the coupon on the last page of the Nibble Software Catalog for ordering information. **ORDER NO.: W03**

LISTING 1: FLOPPY.COPY

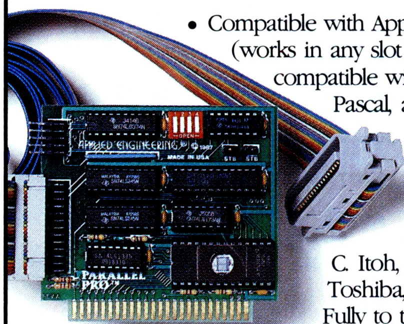
```
10  REM *************************
20  REM *      FLOPPY.COPY      *
30  REM * BY MICHAEL GRUENTHAL *
40  REM *  COPYRIGHT (C) 1988   *
50  REM *  BY MICROSPARC, INC   *
60  REM *  CONCORD, MA. Ø1742   *
70  REM *************************
8Ø  PRINT  CHR$ (21): HIMEM: 38912:S = 6:SC =
     6:D = 1:DC = 2: ONERR  GOTO 4ØØ
9Ø  HOME : HTAB 14: PRINT "FLOPPY COPY": HTAB
     1Ø: PRINT "BY MICHAEL GRUENTHAL": HTAB 1
     1: PRINT "COPYRIGHT (C) 1988": HTAB 11: PRINT
     "BY MICROSPARC, INC.": HTAB 11: PRINT "C
     ONCORD, MA Ø1742"
1ØØ  POKE 34,5: PRINT  CHR$ (4)"BLOADFLOPPY.O
     BJ": FOR I = 47Ø12 TO 47Ø16: READ DA: POKE
     I,DA: NEXT : POKE 48649,19: POKE 4865Ø,3
     : POKE 1Ø1Ø,19: POKE 1Ø11,3: POKE 1Ø12,1
     66: DATA   2Ø6,236,183,48,11,234,234,2Ø6
     ,236,183
11Ø H = 49384:RP = 46995:SL = 47Ø81:DR = SL +
     1:VE = DR + 1:TR = VE + 1:SE = TR + 1:BL
      = SE + 3:BH = BL + 1:CC = BH + 3:VF = C
     C + 2:E = SL - 8:C$ = "=>PRESS ESCAPE TO
      QUIT<=":B$ =  CHR$ (27)
12Ø A$ = "CØ81 N CØ81 N F8ØØ<F8ØØ.FFFFM DØØØ:
     88 N D7D2G": FOR I = 1 TO  LEN (A$): POKE
     511 + I, ASC ( MID$ (A$,I,1)) + 128: NEXT
     : POKE 72,Ø: CALL  - 144
13Ø  POKE 86Ø,95: POKE 866,1ØØ: POKE 6,Ø: CALL
     9Ø5:AU =  PEEK (6) = 128:LC = (AU OR  PEEK
     (6) = 64): VTAB 1: HTAB 35: PRINT  PEEK
     (6);"K":X = 4 - LC:Y = 7 + LC: IF AU THEN
      POKE 48715,96: POKE 86Ø,23: POKE 866,15
     1
14Ø B = 7:C = S: HOME : PRINT : PRINT "SLOT #
      OF ORIGINAL DISK (1-7)?"; SPC( 4);S:CH =
     35:CV = 7: GOSUB 54Ø:S = C:B = 2:C = D: PRINT
     "DRIVE # OF ORIGINAL DISK (1-2)?"; SPC(
     3);D:CV = 8: GOSUB 54Ø:D = C
15Ø  PRINT "SLOT # OF COPY(1-7)?"; SPC( 14);S
     C:B = 7:C = SC:CV = 9: GOSUB 54Ø:SC = C:
      PRINT "DRIVE # OF COPY(1-2)?" SPC( 13);
     DC:B = 2:C = DC:CV = 1Ø: GOSUB 54Ø:DC =
     C:SD = D = DC AND S = SC
16Ø TS = 34: PRINT : PRINT "FORMAT COPY DISK
     (Y/N)?Y": PRINT "=>IF UNSURE, PRESS <RET
     URN><=": PRINT C$: VTAB 12: HTAB 24: GET
     A$:F = (A$ =  CHR$ (78) OR A$ =  CHR$ (1
     1Ø)): GOSUB 36Ø
17Ø  HOME : IF SD THEN  VTAB 1Ø: PRINT "INSER
     T ORIGINAL IN SLOT ";S;", DRIVE ";D; SPC(
     6);"THEN PRESS RETURN": GOSUB 53Ø
18Ø  IF  NOT SD THEN  HOME : VTAB 1Ø: PRINT "
     INSERT ORIGINAL IN SLOT ";S;", DRIVE ";D
     ; SPC( 6);"INSERT COPY IN SLOT ";SC;", D
     RIVE ";DC; SPC( 1Ø);"THEN PRESS RETURN":
      GOSUB 53Ø
```

```
190  IF WP AND  NOT SD AND RW = 2 THEN 230
200 RW = 1: GOSUB 470: ON WP GOTO 170: POKE T
     R,0: POKE SE,0: POKE VF,0: POKE VE,0: POKE
     CC,1: POKE DR,D: POKE SL,S * 16: CALL 76
     8:V =  PEEK (VF): POKE BL,0: POKE BH,150
     : GOSUB 350
210  IF AU THEN  POKE 869,56: CALL 851:TS = 2
     6: GOSUB 300: GOSUB 350: POKE H,0
220  IF SD THEN  HOME : PRINT : PRINT  CHR$ (
     7);"INSERT COPY AND PRESS RETURN": GOSUB
     530
230 RW = 2: GOSUB 470: IF WP THEN  ON SD + 1 GOTO
     180,220
240  POKE VE,V: POKE VF,V: POKE CC,4: POKE DR
     ,DC: POKE SL,SC * 16: IF  NOT F THEN  CALL
     768
250  IF AU THEN TS = 26: POKE VE,0: GOSUB 300
     : GOSUB 350: POKE 869,24: CALL 851:TS =
     34
260  POKE VE,0: POKE BH,150: POKE BL,0: POKE
     DR,DC: POKE SL,SC * 16: GOSUB 350
270  IF AU THEN TS = 17: POKE H,0: GOTO 410
280 TS = 27 - LC: FOR I = 1 TO X:RW = 1: POKE
     DR,D: POKE SL,S * 16
290  IF SD THEN  HOME : PRINT : PRINT  CHR$ (
     7);"INSERT ORIGINAL AND PRESS RETURN": GOSUB
     530: GOSUB 470: IF WP THEN 290
300  POKE SE,15: POKE BH,150: POKE BL,0: IF L
     C THEN  POKE BH,224: POKE CC,RW: POKE TR
     ,TS:TS = TS - 1: POKE E,16: CALL 774: POKE
     BH,150: POKE BL,0
310  ON AU GOTO 390: GOSUB 350:RW = 2
320  POKE DR,DC: POKE SL,SC * 16: IF SD THEN
      HOME : PRINT : PRINT  CHR$ (7);"INSERT
     COPY AND PRESS RETURN": GOSUB 530: GOSUB
     470
330  ON WP GOTO 320: IF LC THEN  POKE CC,RW: POKE
     SE,15: POKE BH,224: POKE BL,0: POKE TR,T
     S + 1: POKE E,16: CALL 774: POKE BH,150:
      POKE BL,0
340  GOSUB 350:TS = TS - Y: NEXT : POKE H,0: POKE
     DR,1: GOSUB 550: GOTO 160
350  POKE SE,15: POKE CC,RW: POKE TR,TS: FOR
     Q = 1 TO Y: POKE E,16: CALL RP: NEXT : POKE
     BL,0: POKE BH,150: RETURN
360  IF A$ <  > B$ THEN  RETURN
370  POP : POKE H,0: POKE DR,1: HOME : PRINT
     : PRINT "WOULD YOU LIKE TO TRY AGAIN (Y/
     N)?Y": VTAB 7: HTAB 35: GET A$: POKE 35,
     24: HOME : IF A$ <  >  CHR$ (78) AND A$ <
      >  CHR$ (110) THEN 110
380  FOR I = 47012 TO 47016: READ DA: POKE I,
     DA: NEXT : POKE 34,0: HOME : POKE 48715,
     145: POKE 216,0: POKE 48649,72: POKE 486
     50,190: POKE 1010,191: POKE 1011,157: POKE
     1012,56: HIMEM: 38400: CALL 976: END
390  RETURN
400  POKE 34,5: CALL 54915: HTAB 1: VTAB 20: POKE
     35,19: INVERSE : PRINT "OOPS. A FATAL ER
     ROR ON TRACK "; PEEK (TR): NORMAL : FOR
     I = 1 TO 5: PRINT  CHR$ (7): NEXT : GOSUB
     370
410 RW = 1: POKE DR,D: POKE SL,S * 16: IF SD THEN
      HOME : PRINT : PRINT  CHR$ (7);"INSERT
     ORIGINAL AND PRESS RETURN": GOSUB 530
420  GOSUB 470: ON WP GOTO 410: FOR I = 1 TO
     2: GOSUB 300: GOSUB 350: IF I = 1 THEN  POKE
     869,56: CALL 821:TS = 8
430  NEXT :RW = 2: POKE H,0
440  POKE DR,DC: POKE SL,SC * 16: IF SD THEN
      HOME : PRINT : PRINT  CHR$ (7);"INSERT
     COPY AND PRESS RETURN": GOSUB 530
450  GOSUB 470: ON WP GOTO 440:TS = 8: FOR I =
     1 TO 2: GOSUB 300: GOSUB 350: IF I = 1 THEN
      POKE 869,24: CALL 874:TS = 17
460  NEXT : POKE H,0: POKE DR,1: GOSUB 550: GOTO
     160
470  IF  NOT SD AND (( NOT AU AND TS <  > 34)
      OR (AU AND TS <  > 34 AND TS <  > 25)) THEN
      RETURN
480 WP = 0: POKE TR,0: POKE SE,0: POKE VE,0: POKE
     CC,0: POKE DR,D: POKE SL,S * 16: POKE 82
     0,S * 16: IF RW = 2 THEN  POKE DR,DC: POKE
     SL,SC * 16: POKE 820,SC * 16
```


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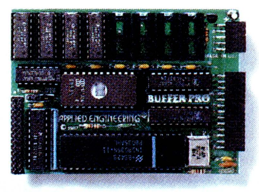
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```
490  CALL 793: IF RW = 1 AND  PEEK (819) = 13
     6 THEN WP = 1: POKE 35,19: VTAB 20: INVERSE
     : PRINT "WRITE-PROTECT ORIGINAL DISK": NORMAL
     : FOR B = 1 TO 5: PRINT  CHR$ (7): NEXT

500  IF RW = 2 AND  PEEK (819) <  > 136 THEN
     WP = 1: POKE 35,19: VTAB 20: INVERSE : PRINT
     "REMOVE WRITE-PROTECT TAB FROM COPY": NORMAL
     : FOR B = 1 TO 5: PRINT  CHR$ (7): NEXT

510  IF WP THEN  POKE H,Ø
520  RETURN
530  PRINT C$: GET A$: POKE 35,24: VTAB 19: CALL
      - 958: GOSUB 360: RETURN
540  HTAB CH: VTAB CV: GET A$:A = ( VAL (A$) <
     1 OR  VAL (A$) > B):C = (C * A) + ( VAL
     (A$) * (A = Ø)): HTAB CH: VTAB CV: PRINT
     C: RETURN
550  HOME : PRINT : PRINT "PRESS RETURN TO MA
     KE ANOTHER COPY": PRINT C$: GET A$: IF A
     $ = B$ THEN  POP : POKE DR,1: GOTO 380
560  RETURN
```

END OF LISTING 1

```
              KEY PERFECT 5.Ø
                  RUN ON
                FLOPPY.COPY
 ===================================
   CODE-5.Ø    LINE# - LINE#   CODE-4.Ø
   --------    -------------   --------
   5E97BF99      1Ø  -  1ØØ        DD62
   41E8FE85     11Ø  -  2ØØ      Ø1F325
   8C858912     21Ø  -  3ØØ        E5C4
   E292D4C7     31Ø  -  4ØØ      Ø11272
   ØFF5ED44     41Ø  -  5ØØ      Ø123A4
   185AF8BA     51Ø  -  56Ø        63A5
   1BØ74618 = PROGRAM TOTAL =      ØD2C
```

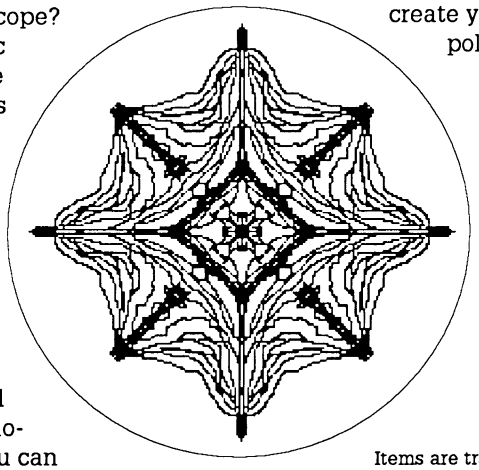
LISTING 2: FLOPPY.OBJ

```
                 1   *******************************
                 2   *           FLOPPY.OBJ        *
                 3   *      BY MICHAEL GRUENTHAL   *
                 4   *       COPYRIGHT (C) 1988    *
                 5   *       BY MICROSPARC, INC    *
                 6   *       CONCORD, MA. Ø1742    *
                 7   *******************************
                 8   * MERLIN PRO ASSEMBLER
                 9           ORG   $3ØØ
                 1Ø  * ZERO PAGE EQUATES
                 11  CONFIG   =    $Ø6       ;Memory configuration code
                 12  A1L      =    $3C
                 13  A1H      =    $3D
                 14  A2L      =    $3E
                 15  A2H      =    $3F
                 16  A4L      =    $42
                 17  A4H      =    $43
                 18  * HARDWARE EQUATES
                 19  LCREAD   =    $CØ8Ø     ;Read-enable language card
                 2Ø  LCON     =    $CØ83     ;Read/Write-enable card
                 21  LCOFF    =    $CØ82     ;Read ROM
                 22  Q6H      =    $CØ8D     ;Load disk drive data latch
                 23  Q7L      =    $CØ8E     ;Set data latch for input
                 24  * DOS EQUATES
                 25  RWTS     =    $3D9
                 26  IOBLOC   =    $3E3
                 27  RWPAGES  =    $B793     ;Read or Write a group of pages
                 28  * ROM EQUATES
                 29  AUXMOVE  =    $C311     ;8Ø-column firmware
                 3Ø  HNDLERR  =    $F2E9     ;Applesoft error handler
                 31  SIGBYTE  =    $FBB3     ;F8 (monitor) ROM version
                 32  *
Ø3ØØ: 2Ø E3 Ø3   33  SPIN     JSR  IOBLOC    ;Call RWTS
Ø3Ø3: 4C D9 Ø3   34           JMP  RWTS
                 35  * ----------------------------
                 36  * USE THE LANGUAGE CARD TO
                 37  * STORE SOME DATA
                 38  * ----------------------------
Ø3Ø6: AD 83 CØ   39           LDA  LCON      ;Turn on language card
Ø3Ø9: AD 83 CØ   4Ø           LDA  LCON      ;and read or write one track
Ø3ØC: 2Ø 93 B7   41           JSR  RWPAGES   ;into bank 2
Ø3ØF: AD 82 CØ   42           LDA  LCOFF     ;Turn card off
Ø312: 6Ø         43           RTS
                 44  * ----------------------------
                 45  * DOS IS PATCHED TO COME HERE
                 46  * WITH A DRIVE ERROR
                 47  * ----------------------------
Ø313: AD 82 CØ   48           LDA  LCOFF     ;Make sure card is off
Ø316: 4C E9 F2   49           JMP  HNDLERR   ;Simulate an error for Applesoft
                 5Ø  * ----------------------------
                 51  * CHECK FOR A WRITE-PROTECT TAB
                 52  * ----------------------------
```


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CIRCLE NUMBER 16

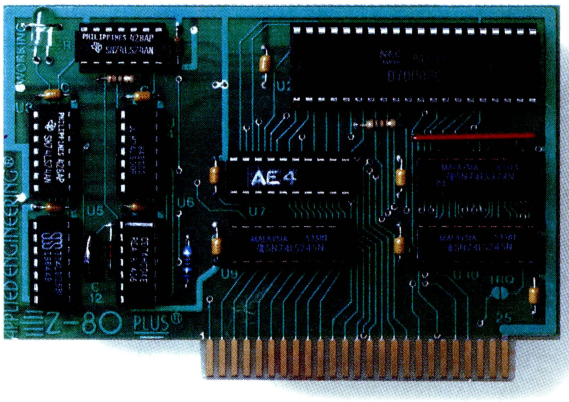
```
0319: 20 00 03  53          JSR   SPIN      ;Ask RWTS to seek track 0, sect 0
031C: AE 34 03  54          LDX   DRIVE     ;Put drive # * 16 in X-Reg
031F: BD 8D C0  55          LDA   Q6H,X     ;Set up hardware
0322: BD 8E C0  56          LDA   Q7L,X     ;Write-protected?
0325: 30 06     57          BMI   TAB       ;Yes
0327: A9 88     58          LDA   #$88      ;No. Tell BASIC program
0329: 8D 33 03  59          STA   WP
032C: 60        60          RTS
032D: A9 00     61   TAB    LDA   #0        ;Tell BASIC there's a tab
032F: 8D 33 03  62          STA   WP
0332: 60        63          RTS
0333: 00        64   WP     HEX   00        ;Write-protect flag
0334: 60        65   DRIVE  HEX   60        ;Drive # * 16
                66   * -------------------------------
                67   * MEMORY MANAGEMENT ROUTINES
                68   * -------------------------------
0335: AD 80 C0  69          LDA   LCREAD
0338: A9 00     70          LDA   #0        ;Set up pointers to move
033A: 85 3C     71          STA   A1L       ;bank 2 RAM ($D000-$E100) into
033C: 85 3E     72          STA   A2L       ;auxiliary ram ($9800-$A900)
033E: 85 42     73          STA   A4L
0340: A9 D0     74          LDA   #$D0
0342: 85 3D     75          STA   A1H
0344: A9 E1     76          LDA   #$E1
0346: 85 3F     77          STA   A2H
0348: A9 98     78          LDA   #$98
034A: 85 43     79          STA   A4H
034C: 38        80          SEC             ;Controls direction of move
034D: 20 11 C3  81          JSR   AUXMOVE   ;Do the move
0350: AD 82 C0  82   SWAP   LDA   LCOFF     ;Turn language card off
0353: A9 00     83          LDA   #0        ;Set up pointers to swap
0355: 85 3C     84          STA   A1L       ;main RAM ($1700-$9700)
0357: 85 3E     85          STA   A2L       ;with the same locations
0359: 85 42     86          STA   A4L       ;in auxiliary RAM
035B: A9 17     87          LDA   #$17
035D: 85 3D     88          STA   A1H
035F: 85 43     89          STA   A4H
0361: A9 97     90          LDA   #$97
0363: 85 3F     91          STA   A2H
0365: 18        92   DIR    CLC             ;Direction
0366: 20 11 C3  93          JSR   AUXMOVE   ;Move
0369: 60        94          RTS
                95   *
036A: AD 83 C0  96          LDA   LCON
036D: AD 83 C0  97          LDA   LCON
0370: A9 00     98          LDA   #0        ;Set up pointers to move
0372: 85 3C     99          STA   A1L       ;auxiliary RAM ($9800-$A900)
0374: 85 42     100         STA   A4L       ;back to bank 2 of the
0376: A9 98     101         LDA   #$98      ;language card
0378: 85 3D     102         STA   A1H
037A: A9 A9     103         LDA   #$A9
037C: 85 3F     104         STA   A2H
037E: A9 D0     105         LDA   #$D0
0380: 85 43     106         STA   A4H
0382: 18        107         CLC             ;Direction
0383: 20 11 C3  108         JSR   AUXMOVE   ;Move
0386: 4C 50 03  109         JMP   SWAP
                110  * -------------------------------
                111  * IDENTIFY CONFIGURATION
                112  * -------------------------------
0389: AD B3 FB  113         LDA   SIGBYTE   ;Where am I?
038C: C9 06     114         CMP   #$06
038E: D0 2E     115         BNE   AIIPLUS   ;Getting old, but still kicking!
0390: AD 17 C0  116         LDA   $C017     ;Is there an 80-col. card?
0393: 30 24     117         BMI   RAM64     ;No
0395: A9 80     118         LDA   #128      ;Yes. Try to move some data
0397: 8D 00 60  119         STA   $6000     ;into auxiliary RAM
039A: A9 38     120         LDA   #$38      ;Put a SEC instruction into
039C: 8D 65 03  121         STA   DIR       ;SWAP routine to set direction
039F: 20 50 03  122         JSR   SWAP      ;Try the move
03A2: A9 00     123         LDA   #0        ;Zero the test byte in main RAM
03A4: 8D 00 60  124         STA   $6000     ;and see if we can restore it
03A7: A9 18     125         LDA   #$18      ;CLC code
03A9: 8D 65 03  126         STA   DIR       ;Set direction
03AC: 20 50 03  127         JSR   SWAP      ;Try to retrieve data
03AF: AD 00 60  128         LDA   $6000     ;Get value in test byte
03B2: C9 80     129         CMP   #128      ;Did it come from aux. RAM?
03B4: D0 03     130         BNE   RAM64     ;No. Tell BASIC there's 64K
03B6: 85 06     131  RAM128 STA   CONFIG    ;Tell BASIC there's 128K
03B8: 60        132         RTS
03B9: A9 40     133  RAM64  LDA   #64
03BB: 85 06     134         STA   CONFIG
03BD: 60        135         RTS
03BE: AD 80 C0  136  AIIPLUS LDA  LCREAD    ;Hello old-timer.
03C1: AD 00 D0  137         LDA   $D000     ;Try to retrieve data
03C4: 2C 82 C0  138         BIT   LCOFF     ;Turn card off
03C7: C9 88     139         CMP   #$88      ;Does it match?
03C9: F0 EE     140         BEQ   RAM64     ;Yes. There's a language card
03CB: A9 30     141  RAM48  LDA   #48       ;16K RAM cards are pretty
03CD: 85 06     142         STA   CONFIG    ;inexpensive these days
03CF: 60        143         RTS

--End assembly, 208 bytes, Errors: 0
```

END OF LISTING 2

```
            KEY PERFECT 5.0
                RUN ON
              FLOPPY.OBJ
==========================================
CODE-5.0    ADDR# - ADDR#     CODE-4.0
--------    -------------     --------
A513278D    0300  - 034F        27C5
39161563    0350  - 039F        244B
8DB4DEB6    03A0  - 03CF        178A
BF49D97C  = PROGRAM TOTAL =       D0
```


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by Bruno Croft

CHINESE CHECKERS

Play Chinese Checkers on a colorful Hi-Res board against a worthy computer opponent.

Chinese Checkers is a classic game, played with marbles on a 9×9 grid. This version of the game pits you against the computer, and it's quite a challenge to beat your electronic opponent.

Although the standard Chinese Checkers board allows as many as six players to participate, this version is one-on-one and uses a slightly modified board (**Figure 1**). The rules of play are exactly the same as for standard Chinese Checkers.

PLAYING THE GAME

The object of the game is to move all your pieces out of your starting triangle, across the board, and into your opponent's starting triangle. Players may move one piece per turn. There are two kinds of moves:

1. *The single move.* Pieces may be moved diagonally forward or directly to the side, one hole at a time, but may not be moved backwards (toward your starting area).
2. *The jumping move.* You may jump over a piece (yours or your opponent's) if there is a vacant hole on the other side of it and may continue jumping until there are no more pieces to jump or you decide to stop. You do not have to make all the jumps that are available. Your net move must always be in the forward or lateral directions, but you may jump backwards as long as at the end of your move you wind up either ahead of, or even with, your starting position.
3. You may not mix single and jumping moves.

The first player to move all 10 pieces to the opposite corner wins the game. You may not leave a piece in your starting triangle to prevent your opponent from winning. If both players take the same number of moves, the game is a draw.

USING THE PROGRAM

To use the program, you must have three files on the disk.

1. CH.CHECKERS (**Listing 1**)
2. CHINESE.TABLES (**Listing 2**)
3. CHINESE.BIN (**Listing 3**)

Bruno Croft, C.P. 80, Rimouski P., Quebec, Canada G5L 7B7.
Chinese Checkers is compatible with both DOS 3.3 and ProDOS.

Start the program with:

RUN CH.CHECKERS

You will see a title screen and be prompted for keyboard or joystick control. Press the K key to select the keyboard option, the J key to play using a joystick, or Escape to quit the program.

If you select the keyboard option, A, S, Z and X become your direction keys, as illustrated on the title screen. Pressing the A key will move the cursor up and to the left, the S key will move it up and to the right, the Z key will move the cursor down to the left, and the X key will move it down to the right. Note that it takes two keypresses to move the cursor sideways in either direction.

If you select the joystick option, you can use the joystick to position the cursor. It may help to hold the joystick at a 45° angle.

Next, you will be asked whether you wish to go first. Press Y to make the first move.

To move a piece, position the cursor over it and press the Space bar or push the joystick button. The piece will be highlighted. Then

FIGURE 1: Chinese Checkers Playing Board

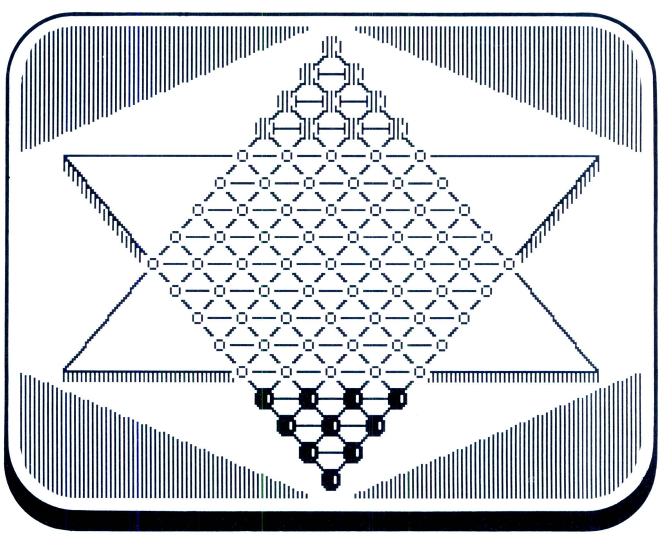


FIGURE 2: Board Representation

```
              Computer's
              Pieces = $Ø2
$3FFF:  FF FF FF FF FF FF FF FF FF FF FF
        FF FF FF FF FF FF FF FF FF FF FF
        FF Ø2 Ø2 Ø2 Ø2 ØØ ØØ ØØ ØØ ØØ FF
        FF Ø2 Ø2 Ø2 ØØ ØØ ØØ ØØ ØØ ØØ FF
        FF Ø2 Ø2 ØØ ØØ ØØ ØØ ØØ ØØ ØØ FF
        FF Ø2 ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ FF
        FF ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ FF
        FF ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ Ø1 FF
        FF ØØ ØØ ØØ ØØ ØØ ØØ ØØ Ø1 Ø1 FF
        FF ØØ ØØ ØØ ØØ ØØ ØØ Ø1 Ø1 Ø1 FF
        FF ØØ ØØ ØØ ØØ ØØ Ø1 Ø1 Ø1 Ø1 FF
        FF FF FF FF FF FF FF FF FF FF FF
$4Ø83:  FF FF FF FF FF FF FF FF FF FF FF
                              Player's
                              Pieces = $Ø1
```

move the cursor to the last hole of your move, and press the Space bar or push the joystick button. Once you do so, the piece will move to that hole and resume its original color. Be careful: You cannot withdraw a move once it's completed. To change your mind before you've completed the move, just position the cursor over the highlighted piece and push the Space bar or joystick button again. The piece will be unhighlighted, and you may choose another piece to move. The computer will not let you make an illegal move.

Play alternates between you and the computer. There is no time limit, so don't rush your moves. Take time to consider all the possible jumps.

When the computer moves, there is no indication of the path it takes; the piece is moved directly to the end position of the move. This may be disconcerting at first, especially if you didn't see that move coming. At times, it may appear that the computer is cheating, but if you examine the board closely you will always find a legal move. Remember, jumping backwards is legal as long as the piece doesn't end up farther back.

At the end of the game, you have the option to play another game or quit the program.

ENTERING THE PROGRAM

To enter the program, first type in the Applesoft program in **Listing 1**, and save it with:

SAVE CH.CHECKERS

Next, enter the Monitor by typing CALL −151, and type in the hexadecimal code in **Listing 2**, and save it with:

BSAVE CHINESE.TABLES,A$4000,L$190

Finally, type in the hex code portion from **Listing 3**, and save it with:

BSAVE CHINESE.BIN,A$803,L$164

FIGURE 3: Evaluation Grid

```
$41ØA:  ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ
        ØØ Ø1 11 1F 2D 2E 2F 3Ø 31 32 ØØ
        ØØ 11 2Ø 2E 3A 46 47 48 49 4A ØØ
        ØØ 21 2E 3D 47 51 5B 5C 5D 5E ØØ
        ØØ 2D 3A 47 52 5C 64 6C 6D 6E ØØ
        ØØ 3E 46 52 5C 65 6D 73 79 7A ØØ
        ØØ 2F 47 5B 64 6D 74 7A 7E 83 ØØ
        ØØ 3Ø 48 5C 6C 73 7A 7F 82 85 ØØ
        ØØ 31 49 5D 6D 79 7E 82 86 88 ØØ
        ØØ 32 4A 5E 6E 7A 83 85 88 89 ØØ
$41F8:  ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ
The shortest path from
corner to corner is highlighted.
```

If you have an assembler, you may wish to type in the entire source code and assemble it instead.

For help with entering *Nibble* programs, see the Typing Tips section.

HOW IT WORKS

Figure 2 shows how the board is represented in memory. The borders of the board are represented by $FFs, the computer's playing pieces are represented by $02s, and the player's pieces are represented by $01s.

When the Applesoft program calls the machine language routine called STORE (**lines 198-210** of **Listing 3**), the current state of the board is saved at $4316. Then the LOOK routine (**lines 32-50**) is called. **Lines 32-37** initialize some addresses; locations $00 and $01 are the low and high values of the address of the first hole to examine. Location $301 (LENGTH) holds the length of the best move. **Line 38** is the beginning of the loop that looks at each hole from $4016 (which represents position 9,9 or the bottom corner on the board) to $4076 (which represents position 1,1 or the top corner). **Line 40** checks whether the hole contains a computer piece ($02). If so, the $02 is replaced with a $06 as a place marker for the currently active piece.

The SCAN routine at **line 54** examines each direction for possible moves. Since the holes are arranged in a hexagonal pattern, there are six possible directions from each hole: two forward, two sideways, and two backwards. If a hole is empty, the program stops looking in that direction because there are no jumps possible. If the hole contains a piece, the program examines the hole beyond it. If it is empty, it is a possible move, and a $06 is placed there to mark it. A $04 is placed in the previous position to show that it has already been examined.

Then the SCAN routine runs again, and this time the $04 will be ignored, and the scan will take place from the current $06 marker. This is repeated as long as a $06 is found. The program then checks whether all of the holes have been examined; if not, it increments HOLE and returns to **line 55**.

When the routine ends, each possible pathway is full of $04s. The program now goes to **line 102** to check for possible single moves. All four directions are examined and $04s are placed in each possible position for single moves.

Next, the program branches to **lines 136-149** where the entire board is scanned to find the best move. **Figure 3** is the Evaluation Table that determines the computer's choices. For every $04 that has been placed on the board, the low byte of the address is stored in the STOR1 array at $4200. The value from the Evaluation Table that corresponds to the hole is fetched and stored in the STOR2 array at $4250. From these values, the program determines the length of the jump, and it is compared to the best length so far, which is stored in LENGTH ($301). This location is updated each time a longer jump is found. At the same time, the low byte of TO ($303) is updated with the low byte of the address from STOR1.

When this process is finished, the address of the best move is in TO. The Applesoft program PEEKs this value, and determines the proper coordinates on the screen at which to draw the piece. This routine is also used to check the legality of the player's move.

The Evaluation Table deserves a little more explanation. In **Figure 3**, the jagged line represents the shortest path from corner to corner. If you subtract the value of the preceding hole from each hole, you get $10, $0F, $0E, $0D, $0C, $0B, etc. Using these values to evaluate a move will cause the computer to prefer a single move from hole value $01 to $11 (difference $10) to a jumping move from $7F to $85 to $89 (difference $0A).

A MODIFICATION

The values I have chosen for the Evaluation Table will cause the computer to keep its pieces close together and near the diagonal line from corner to corner. You may wish to experiment with the values in the table to determine the results of other strategies.

THE **JANUARY 1988 DISK** CONTAINS THIS PROGRAM

If you'd rather not type in the listing for this program, you can buy it on disk, complete, free of typos and ready to run. *Nibble*'s January 1988 programs are available on a single disk for an introductory price of $12.95 from *Nibble*, 52 Domino Dr., Concord, MA 01742. Add $2.50 for shipping/handling within the U.S. and Canada; $7.50 for overseas air mail. Introductory price expires 3/31/88; after that date, the price will be $16.95. See the coupon on the last page of the Nibble Software Catalog for ordering information. **ORDER NO.: W03**

LISTING 1: CH.CHECKERS

```
10  REM ************************
20  REM *                      *
30  REM * CH.CHECKERS          *
40  REM * BY BRUNO CROFT       *
50  REM * COPYRIGHT (C) 1988   *
60  REM * BY MICROSPARC, INC.  *
70  REM * CONCORD, MA  01742   *
80  REM ************************
90  GOTO 140
100 MA = 0: FOR I = 9 TO 6 STEP  - 1: FOR J =
     15 - I TO 9: IF  PEEK (16514 - I * 11 -
     J) = 1 THEN MA = MA + 1
110  NEXT J,I: RETURN : REM  PLAYER'S TRIANGL
     E
120 MA = 0: FOR I = 1 TO 4: FOR J = 1 TO 5 -
     I: IF  PEEK (16514 - I * 11 - J) = 2 THEN
     MA = MA + 1
130  NEXT J,I: RETURN : REM  APPLE'S TRIANGLE
140 D$ =  CHR$ (4): ONERR  GOTO 1780
150  PRINT D$"VERIFY CHINESE.BIN": PRINT D$"V
     ERIFY CHINESE.TABLES": POKE 216,0
160  IF  PEEK (104) <  > 96 THEN  POKE 103,1:
      POKE 104,96: POKE 24576,0: PRINT D$;"RU
     N CH.CHECKERS"
170 B$ =  CHR$ (7): GOSUB 1120: PRINT D$;"BLO
     AD CHINESE.BIN": PRINT D$;"BLOAD CHINESE
     .TABLES": POKE 2,22: POKE 3,65:B = 0:W =
     3:TIME = 70: SCALE= 1: ROT= 0
180  VTAB 22: PRINT "J)OYSTICK, K)EYBOARD OR
     <ESC> TO END": GET A$: IF A$ =  CHR$ (27
     ) THEN  TEXT : HOME : END
190  ON A$ <  > "K" AND A$ <  > "J" GOTO 180:
      IF A$ = "K" THEN KB = 1: REM  8 SPACES
200  VTAB 23: HTAB 6: PRINT " DO YOU WANT TO
     GO FIRST? ";: GET A$: IF A$ <  > "Y" AND
     A$ <  > "N" THEN  PRINT B$;: VTAB 22: GOTO
     200
210  HOME : POKE  - 16304,0: POKE  - 16300,0:
      POKE  - 16297,0: POKE  - 16302,0: IF A$
      = "Y" THEN  GOSUB 1290: GOTO 590
220  GOSUB 1290: GOTO 380
230  CALL 2400: REM  APPLE'S MOVE
240  IF  PEEK (16406) = 0 THEN  POKE 16662,16
     : REM  PATCH FOR BACKJUMP
250 R = 118 -  PEEK (770):R1 =  INT (R / 11) +
     1:C = R -  INT (R / 11) * 11 + 1:R = 118
      -  PEEK (771):R2 =  INT (R / 11) + 1:C2
      = R -  INT (R / 11) * 11 + 1
260 COUP = COUP + 1: IF R2 = R1 AND C2 = C THEN
     280: REM   NO MOVE FOUND
270  POKE (16514 - R2 * 11 - C2),2: POKE (165
     14 - R1 * 11 - C),0: GOTO 290
280  POKE  - 16301,0: FLASH : VTAB 22: HTAB 1
     6: PRINT "** I WIN **"B$B$: NORMAL : VTAB
     23: PRINT "PRESS <RETURN> TO CONTINUE";:
      GET CH$: PRINT CH$: RESTORE : HOME : GOTO
     90
290  GOSUB 300: GOSUB 510: GOTO 590
300  REM  DRAW APPLE'S MOVE
310 XA = 140 + (R1 - C) * 10:YA = 206 - (R1 +
     C) * 11: FOR XX = 1 TO 5: IF XX = 1 THEN
      POKE 7,30 + R1 * C: CALL 772
320  HCOLOR= W: DRAW 1 AT XA,YA: HCOLOR= B: DRAW
     2 AT XA,YA: IF XX = 5 THEN 340
330  FOR ZZ = 1 TO TIME / 2: NEXT : HCOLOR= W
     : DRAW 2 AT XA,YA: HCOLOR= 5: DRAW 1 AT
     XA,YA: FOR ZZ = 1 TO TIME / 2: NEXT
340  NEXT :XA = 140 + (R2 - C2) * 10:YA = 206
      - (R2 + C2) * 11: FOR XX = 1 TO 3: HCOLOR=
     W: DRAW 2 AT XA,YA: HCOLOR= 5: DRAW 1 AT
     XA,YA: IF XX = 1 THEN  POKE 6,30: POKE 7
     ,30 + R2 * C2: CALL 772
350  IF XX = 3 THEN 370
360  FOR ZZ = 1 TO TIME / 2: NEXT : HCOLOR= W
     : DRAW 1 AT XA,YA: HCOLOR= B: DRAW 2 AT
     XA,YA: FOR ZZ = 1 TO TIME / 2: NEXT
370  NEXT : RETURN
380  REM  OPENINGS
390  IF COUP > 0 THEN 230
400 OP =  INT ( RND (1) * 10): IF OP < 5 THEN
     420
410 R1 = 9:C = 6:R2 = 8:C2 = 6: GOTO 260
420 R1 = 6:C = 9:R2 = 6:C2 = 8: POKE 16664,30
     : GOTO 260
430  REM  PLAYER'S END
440  GOSUB 100: IF MA <  > 10 THEN 500
450  IF NU = 1 THEN  POKE  - 16301,0: FLASH :
      VTAB 22: HTAB 16: PRINT "** DRAW **"B$B
     $: NORMAL : VTAB 23: PRINT "PRESS <RETUR
     N> TO CONTINUE";: GET CH$: PRINT : RESTORE
     : HOME : GOTO 90
460  CALL 2400:R = 118 -  PEEK (770):R1 =  INT
     (R / 11) + 1:C = R -  INT (R / 11) * 11 +
     1:R = 118 -  PEEK (771):R2 =  INT (R / 1
     1) + 1:C2 = R -  INT (R / 11) * 11 + 1
470  POKE (16514 - R2 * 11 - C2),2: POKE (165
     14 - R1 * 11 - C),0: GOSUB 120: GOSUB 30
     0: HOME : POKE  - 16301,0: FLASH : VTAB
     22: HTAB 16
480  IF MA = 10 THEN  PRINT "** DRAW **"B$: NORMAL
     : VTAB 23: PRINT "PRESS <RETURN> TO CONT
     INUE";: GET CH$: PRINT : RESTORE : HOME
     : GOTO 90
490  HTAB 14: PRINT "** YOU WIN **"B$B$: NORMAL
     :: VTAB 23: PRINT "PRESS <RETURN> TO CON
     TINUE";: GET CH$: PRINT : RESTORE : HOME
     : GOTO 90
500  RETURN
510  REM  APPLE'S END
520  GOSUB 120
530  IF MA <  > 10 THEN 580
540  IF FI = 0 THEN 560
550  GOSUB 100: IF MA = 9 THEN 570
560  POKE  - 16301,0: FLASH : VTAB 22: HTAB 1
     5: PRINT "** I WIN **"B$B$: NORMAL : VTAB
     23: PRINT "PRESS <RETURN> TO CONTINUE";:
      GET CH$: PRINT : RESTORE : HOME : GOTO
     90
570  HOME : POKE  - 16301,0: FLASH : VTAB 22:
      HTAB 2: PRINT "* YOU MUST FINISH THIS T
     URN FOR DRAW *"B$B$: FOR I = 1 TO 1200: NEXT
     : POKE  - 16302,0: HOME :NU = 1: NORMAL

580  RETURN
590  REM  PLAYER'S MOVE
600  IF  NOT KB THEN 630
610 H = 5:V = 5
620  GOSUB 1210: GOTO 650
630  IF  PEEK ( - 16287) > 127 THEN 630
640 V = 9 -  INT ( PDL (0) / 30):H = 9 -  INT
     ( PDL (1) / 30)
650 HOLE =  PEEK (16514 - H * 11 - V):XA = 14
     0 + (H - V) * 10:YA = 206 - (H + V) * 11
     : IF HOLE <  > 0 THEN 670
660  HCOLOR= W: DRAW 2 AT XA,YA
670  HCOLOR= 2: DRAW 1 AT XA,YA: IF KB THEN 7
     00
680  IF  PEEK ( - 16287) > 127 AND HOLE = 1 THEN
     780
690  GOTO 710
700  IF KB AND HOLE = 1 THEN  IF X = 160 THEN
     780
710  FOR T = 1 TO TIME / 2: NEXT : IF HOLE <
      > 2 THEN 730
720  HCOLOR= 5: DRAW 1 AT XA,YA: GOTO 760
730  IF HOLE <  > 1 THEN 750
740  HCOLOR= B: DRAW 1 AT XA,YA: GOTO 760
750  HCOLOR= W: DRAW 1 AT XA,YA: HCOLOR= B: DRAW
     2 AT XA,YA
760  FOR T = 1 TO TIME / 2: NEXT :M1 = H:N1 =
     V: IF KB THEN 620
770  GOTO 640
780  REM  MOVE TO
790  POKE 6,30: POKE 7,30 + H1 * V1: CALL 772
     : HCOLOR= 1: POKE 16514 - H * 11 - V,6: CALL
     2367: DRAW 1 AT XA,YA:H1 = H:V1 = V: POKE
     16514 - H * 11 - V,3
800  IF  NOT KB THEN 830
```

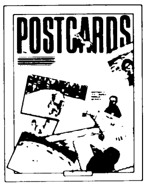
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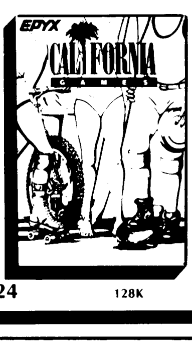
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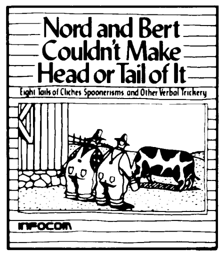
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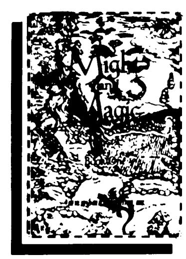
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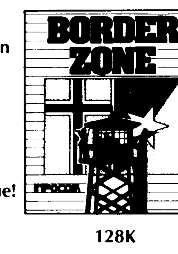
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LISTING 1: CHINESE.CHECKERS *(continued)*

```
810  REM
820  GOSUB 1210: GOTO 850
830  IF  PEEK ( - 16287) > 127 THEN 830
840 V = 9 -  INT ( PDL (0) / 30):H = 9 -  INT
     ( PDL (1) / 30)
850 HOLE =  PEEK (16514 - H * 11 - V):XA = 14
     0 + (H - V) * 10:YA = 206 - (H + V) * 11
     : IF HOLE <  > 0 AND HOLE <  > 4 THEN 87
     0
860  HCOLOR= W: DRAW 2 AT XA,YA
870  HCOLOR= 2: DRAW 1 AT XA,YA: IF  NOT KB THEN
     900
880  IF X <  > 160 THEN 960
890  GOTO 910
900  IF  PEEK ( - 16287) < 128 THEN 960
910  IF HOLE = 4 AND (H + V) >  = (H1 + V1) THEN
     1060
920  IF HOLE = 0 AND  ABS (H - H1) < 2 AND  ABS
     (V - V1) < 2 AND (H + V) >  = (H1 + V1) AND
     (H + V) < (H1 + V1 + 2) THEN 1060
930  IF HOLE = 3 THEN  HCOLOR= B: DRAW 1 AT X
     A,YA: CALL 2341: POKE 16514 - H * 11 - V
     ,1: POKE 6,30: POKE 7,30 + H1 * V1: CALL
     772: GOTO 590
940  POKE  - 16301,0: HOME : FLASH : VTAB 22:
      HTAB 14: PRINT " ILLEGAL MOVE ": FOR K =
     1 TO 2: POKE 6,200: POKE 7,60: CALL 772:
      FOR J = 1 TO 50: NEXT : POKE 6,200: POKE
     7,72: CALL 772: FOR J = 1 TO 100: NEXT :
      NEXT
950  NORMAL : POKE  - 16302,0: HOME
960  FOR T = 1 TO TIME / 2: NEXT : IF HOLE <
      > 2 THEN 980
970  HCOLOR= 5: DRAW 1 AT XA,YA: GOTO 1030
980  IF HOLE <  > 1 THEN 1000
990  HCOLOR= B: DRAW 1 AT XA,YA: GOTO 1030
1000  IF HOLE <  > 3 THEN 1020
1010  HCOLOR= 1: DRAW 1 AT XA,YA: GOTO 1030
1020  HCOLOR= W: DRAW 1 AT XA,YA: HCOLOR= B: DRAW
     2 AT XA,YA
1030  FOR T = 1 TO TIME / 2: NEXT : IF KB THEN
     820
1040  GOTO 840
1050  POKE 16514 - H1 * 11 - V1,0: FOR XX = 1
      TO 4: HCOLOR= W: DRAW 1 AT XA,YA: HCOLOR=
     B: DRAW 2 AT XA,YA: IF XX = 4 THEN 1090
1060  HCOLOR= 1: DRAW 1 AT XA,YA: POKE 6,30: POKE
     7,30 + H1 * V1: CALL 772: FOR ZZ = 1 TO
     TIME * 2: NEXT :XA = 140 + (H1 - V1) * 1
     0:YA = 206 - (H1 + V1) * 11: CALL 2341
1070  POKE 16514 - H1 * 11 - V1,0: FOR XX = 1
      TO 4: HCOLOR= W: DRAW 1 AT XA,YA: HCOLOR=
     B: DRAW 2 AT XA,YA: IF XX = 4 THEN 1090
1080  FOR ZZ = 1 TO TIME / 2: NEXT : HCOLOR=
     W: DRAW 2 AT XA,YA: HCOLOR= 1: DRAW 1 AT
     XA,YA: FOR ZZ = 1 TO TIME / 2: NEXT
1090  NEXT : POKE 6,30: POKE 7,30 + H1 * V1: CALL
     772:XA = 140 + (H - V) * 10:YA = 206 - (
     H + V) * 11: FOR XX = 1 TO 3: HCOLOR= W:
      DRAW 1 AT XA,YA: IF XX = 3 THEN 1110
1100  HCOLOR= B: DRAW 2 AT XA,YA: FOR ZZ = 1 TO
     TIME / 2: NEXT : HCOLOR= W: DRAW 2 AT XA
     ,YA: HCOLOR= 1: DRAW 1 AT XA,YA: FOR ZZ =
     1 TO TIME / 2: NEXT : NEXT
1110  HCOLOR= B: DRAW 1 AT XA,YA: POKE 16514 -
     H * 11 - V,1: GOSUB 430: GOTO 380
1120  REM
1130  HGR : TEXT : HOME : PRINT "------------
     -----------------------------CHINESE CHEC
     KERS          BY BRUNO CROFT------------
     ---------------------------": REM  41 D
     ASHES EACH
1140  PRINT "   COPYRIGHT 1988 BY MICROSPARC,
      INC."
1150  PRINT : PRINT "    REDS: APPLE II": PRINT
     "    BLACKS: YOU": PRINT : PRINT : PRINT
     "              KEYBOARD CONTROLS": PRINT
1160  PRINT  SPC( 18)"A   S" SPC( 36) CHR$ (9
     2)" /" SPC( 38);: FLASH : PRINT " ";: NORMAL
     : PRINT  SPC( 38)"/ " CHR$ (92) SPC( 36)
     "Z   X"
1170  PRINT : PRINT
1180  PRINT "    USE SPACE BAR TO ENTER YOUR
     MOVE"
1190  PRINT "--------------------------------
     --------": REM  41 DASHES
1200  PRINT
1210 X =  PEEK ( - 16384): IF X > 127 THEN 12
     30: PRINT
1220  RETURN
1230  IF X = 160 THEN 1280
1240  IF X = 193 THEN V = V + 1: IF V > 9 THEN
     V = 9: GOTO 1280
1250  IF X = 211 THEN H = H + 1: IF H > 9 THEN
     H = 9: GOTO 1280
1260  IF X = 218 THEN H = H - 1: IF H < 1 THEN
     H = 1: GOTO 1280
1270  IF X = 216 THEN V = V - 1: IF V < 1 THEN
     V = 1
1280  POKE  - 16368,0: RETURN
1290  FOR I = 768 TO 823: READ A: POKE I,A: NEXT

1300  GOTO 1330
1310 X = 140 + (H - V) * 10:Y = (H + V) * 11 -
     14
1320  RETURN
1330  HGR : HCOLOR= 3: POKE  - 16302,0
1340  HPLOT 0,0: CALL 62454
1350  HCOLOR= 1
1360 GC = 0
1370  HCOLOR= GC
1380 Y = 96
1390  POKE 232,0: POKE 233,3: SCALE= 1: ROT=
     1
1400  FOR X = 60 TO 140 STEP 10
1410  HPLOT X,Y TO X + 80,Y + 88
1420  HPLOT X,192 - Y TO X + 80,104 - Y
1430  HPLOT X,192 - Y TO 280 - X,192 - Y
1440  HPLOT X,Y TO 280 - X,Y
1450 Y = Y - 11
1460  NEXT X
1470  HCOLOR= GC
1480  HPLOT 100,140 TO 20,52 TO 260,52 TO 180
     ,140
1490  HCOLOR= 1: FOR I = 2 TO 5: HPLOT 20,52 +
     I TO 54,90 + I: NEXT
1500  FOR I = 2 TO 5: HPLOT 260,52 + I TO 226
     ,90 + I: NEXT
1510  HCOLOR= 4
1520  HPLOT 100,52 TO 20,140 TO 260,140 TO 18
     0,52
1530  HCOLOR= 1: FOR I = 141 TO 144: HPLOT 20
     ,I TO 96,I: HPLOT 184,I TO 260,I: NEXT :
      HCOLOR= 4
1540  FOR H = 1 TO 9: FOR V = 1 TO 9
1550  IF (H + V < 6) OR (H + V > 14) THEN 159
     0
1560  GOSUB 1310
1570  HCOLOR= 3: DRAW 1 AT X,Y
1580  HCOLOR= 0: DRAW 2 AT X,Y
1590  NEXT : NEXT
1600  GOSUB 1680
1610  HCOLOR= 6
1620  FOR I = 0 TO 50: HPLOT 0,I TO 130,0
1630  HPLOT 279,I TO 150,0
1640  HPLOT 0,191 - I TO 130,191
1650  HPLOT 279,191 - I TO 150,191
1660  NEXT
1670  GOSUB 1810: RETURN
1680  FOR H = 1 TO 4: FOR V = 1 TO 5 - H:A(H,
     V) = 2: GOSUB 1310
1690  HCOLOR= 3: DRAW 2 AT X,Y: HCOLOR= 5
1700  DRAW 1 AT X,Y: NEXT V
1710  NEXT H
1720  HCOLOR= 0
1730  FOR I = 4 TO 1 STEP  - 1
1740  FOR J = 1 TO I:A(5 + I,10 - J) = 1:H =
     5 + I:V = 10 - J
1750  HCOLOR= 3: GOSUB 1310: DRAW 2 AT X,Y: HCOLOR=
     0: DRAW 1 AT X,Y
1760  NEXT : NEXT
1770  RETURN
1780  HOME : VTAB 12: PRINT "UNABLE TO LOAD C
     HINESE.BIN": PRINT " OR CHINESE.TABLES":
      PRINT : END
1790  DATA  2,0,6,0,46,0,128,128,192,43,45,11
     7,63,63,63,30,45,45,45,45,62,31,63,63,55
     ,45,45,109,53,255,63,63,55
1800  DATA  45,45,45,45,30,63,63,63,14,45,45,
     5,0,192,45,14,54,30,63,28,36,4,0
```

```
1810  REM  POKE SHAPE TABLE
1820  FOR I = 2560 TO 2615: READ A: POKE I,A:
      NEXT : DATA 2,0,6,0,46,0,128,128,192,43
     ,45,117,63,63,63,30,45,45,45,45,62,31,63
     ,63,55,45,45,109,53,255,63,63,55
1830  DATA  45,45,45,45,30,63,63,63,14,45,45,
     5,0,192,45,14,54,30,63,28,36,4,0: POKE 2
     32,0: POKE 233,10: GOSUB 1850: RETURN
1840  REM  POKE SOUND ROUTINE
1850  POKE 772,173: POKE 773,48: POKE 774,192
     : POKE 775,136: POKE 776,208: POKE 777,4
     : POKE 778,198: POKE 779,6: POKE 780,240
1860  POKE 781,8: POKE 782,202: POKE 783,208:
      POKE 784,246: POKE 785,166: POKE 786,7:
      POKE 787,76: POKE 788,4: POKE 789,3: POKE
     790,96: RETURN
```

END OF LISTING 1

```
            KEY PERFECT 5.0
                RUN ON
             CH.CHECKERS
=====================================
  CODE-5.0    LINE# - LINE#    CODE-4.0
  --------    -------------    --------
  9EA50E4B      10  -   100      68D6
  B09F9B2E     110  -   200      F2BB
  53B0AEDD     210  -   300      D582
  623447F9     310  -   400      B915
  EB0B06EA     410  -   500      ED00
  17B3436E     510  -   600      85CF
  6F52495C     610  -   700      7489
  4AF27AE7     710  -   800      794C
  E4838874     810  -   900      681A
  2B4A2E8A     910  -  1000      BFD1
  26F6615A    1010  -  1100    010493
  40323CB1    1110  -  1200      D385
  F0475B74    1210  -  1300      5E3C
  54A50162    1310  -  1400      390B
  EAA9BDEC    1410  -  1500      5308
  E2E670C0    1510  -  1600      4E6B
  C24D8F81    1610  -  1700      45D3
  00F98D43    1710  -  1800      9FA1
  4AC1E042    1810  -  1860      C44D
  A9789197 = PROGRAM TOTAL =     1820
```

LISTING 2: CHINESE.TABLES

```
CHINESE.TABLES

4000- FF FF FF FF FF FF FF FF
4008- FF FF FF FF FF FF FF FF
4010- FF FF FF FF FF FF 02 02
4018- 02 02 00 00 00 00 00 FF
4020- FF 02 02 02 00 00 00 00
4028- 00 00 FF FF 02 02 00 00
4030- 00 00 00 00 00 FF FF 02
4038- 00 00 00 00 00 00 00 00
4040- FF FF 00 00 00 00 00 00
4048- 00 00 00 FF FF 00 00 00
4050- 00 00 00 00 00 01 FF FF
4058- 00 00 00 00 00 00 00 01
4060- 01 FF FF 00 00 00 00 00
4068- 00 01 01 01 FF FF 00 00
4070- 00 00 00 01 01 01 01 FF
4078- FF FF FF FF FF FF FF FF
4080- FF FF FF FF FF FF FF FF
4088- FF FF FF FF FF FF FF FF
4090- FF FF 4A 4A FF FF 4A 4A
4098- FF FF 4A 4A FF FF 4A 4A
40A0- FF FF 46 42 FF FF 42 42
40A8- FF FF 42 42 FF FF 42 42
```

LISTING 2: CHINESE.TABLES *(continued)*

```
40B0- FF FF 02 02 FF FF 02 02
40B8- FF FF 02 02 FF FF 02 02
40C0- FF FF 04 04 FF FF 04 04
40C8- FF FF 04 04 FF FF 04 04
40D0- FF FF 04 00 FF FF 00 00
40D8- FF FF 00 00 FF FF 00 00
40E0- BF FF 04 00 FF FF 00 00
40E8- FF FF 00 00 FF FF 00 00
40F0- FF FF 04 00 FF FF 00 00
40F8- FF FF 00 00 FF FF 00 00
4100- 00 00 00 00 00 00 00 00
4108- 00 00 00 00 00 00 00 00
4110- 00 00 00 00 00 00 01 11
4118- 1F 2D 2E 2F 30 31 32 00
4120- 00 11 20 2E 3A 46 47 47
4128- 47 4A 00 00 1F 2E 3B 47
4130- 51 5B 5C 5D 5E 00 00 2D
4138- 3A 47 52 5C 64 6C 6D 6E
4140- 00 00 2E 46 51 5C 65 6D
4148- 73 79 7A 00 00 2F 47 5B
4150- 64 6D 74 7A 7E 83 00 00
4158- 30 48 5C 6C 73 7A 7F 82
4160- 85 00 00 31 49 5D 6D 79
4168- 7E 82 86 88 00 00 32 4A
4170- 5E 6E 7A 83 85 88 89 00
4178- 00 00 00 00 00 00 00 00
4180- 00 00 00 00 00 00 00 00
4188- 00 00 00 00 00 00 00 00
```

END OF LISTING 2

```
            KEY PERFECT 5.0
                RUN ON
            CHINESE.TABLES
=====================================
  CODE-5.0    ADDR# - ADDR#    CODE-4.0
  --------    -------------    --------
  332BFB1A     4000 - 404F       1E96
  18AB885C     4050 - 409F       2324
  38F69615     40A0 - 40EF       29AA
  2BD9EE2D     40F0 - 413F       28DD
  A754DAA2     4140 - 418F       289B
  BE83B6DF = PROGRAM TOTAL =     0190
```

LISTING 3: CHINESE.BIN

```
SOURCE FILE: CHINESE.BIN.S
0000:            1 ******************************
0000:            2 *   CHINESE.BIN              *
0000:            3 *   BY BRUNO CROFT           *
0000:            4 *   COPYRIGHT 1988 BY        *
0000:            5 *   MICROSPARC, INC.         *
0000:            6 *   CONCORD, MA 01742        *
0000:            7 *   DOS TOOLKIT ASSEMBLER    *
0000:            8 ******************************
0000:            9 HOLE     EQU  $00
0000:           10 AH       EQU  $00
0001:           11 AL       EQU  $01
0002:           12 COMPBI   EQU  $02
003C:           13 A1L      EQU  $3C
003D:           14 A1H      EQU  $3D
003E:           15 A2L      EQU  $3E
003F:           16 A2H      EQU  $3F
0042:           17 A4L      EQU  $42
0043:           18 A4H      EQU  $43
```

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LISTING 3: CHINESE.BIN *(continued)*

```
0300:           19 NUMBER  EQU  $300
0301:           20 LENGTH  EQU  $301
0302:           21 FROM    EQU  $302
0303:           22 TO      EQU  $303
4016:           23 TABLE   EQU  $4016
4116:           24 TABV    EQU  $4116
4200:           25 STOR1   EQU  $4200
4250:           26 STOR2   EQU  $4250
FE2C:           27 MOVE    EQU  $FE2C
----- NEXT OBJECT FILE NAME IS CHINESE.BIN
0803:           28         ORG  $803
0803:           29 *-------------------------------
0803:           30 * CHECK EACH HOLE FOR BEST MOVE
0803:           31 *-------------------------------
0803:A9 16      32 LOOK    LDA  #$16       ;INITIALIZE FIRST HOLE
0805:85 00      33         STA  AH
0807:A9 40      34         LDA  #$40
0809:85 01      35         STA  AL
080B:A0 00      36         LDY  #$0
080D:8C 01 03   37         STY  LENGTH     ;RESET LENGTH
0810:A0 00      38 LOOP    LDY  #$00
0812:B1 00      39         LDA  (HOLE),Y
0814:C9 02      40         CMP  #$2        ;APPLE'S MARBLE?
0816:D0 0A      41         BNE  INCR       ;NO, PASS TO NEXT HOLE
0818:09 04      42         ORA  #$4        ;YES,CHANGE TO $06
081A:91 00      43         STA  (HOLE),Y
081C:20 2B 08   44         JSR  SCAN       ;CHECKS JUMP FOR MARBLE
081F:20 D3 08   45         JSR  EVAL       ;FINDS BEST LENGTH
0822:E6 00      46 INCR    INC  HOLE
0824:A5 00      47         LDA  HOLE
0826:C9 77      48         CMP  #$77       ;LAST HOLE?
0828:30 E6      49         BMI  LOOP       ;NO
082A:60         50         RTS
082B:           51 *-------------------------------
082B:           52 * SCAN FOR ALL POSSIBLE JUMPS
082B:           53 *-------------------------------
082B:A2 00      54 SCAN    LDX  #$0
082D:BD 16 40   55 JUMP    LDA  TABLE,X
0830:C9 06      56         CMP  #$6        ;MARBLE?
0832:D0 62      57         BNE  NEXT       ;NO, PASS TO NEXT HOLE
0834:           58 * DWNRGHT
0834:BD 17 40   59         LDA  TABLE+1,X ;CHECK 1ST DIRECTION
0837:F0 0A      60         BEQ  DWNLFT     ;EMPTY,LOOK ELSEWHERE
0839:BD 18 40   61         LDA  TABLE+2,X ;HOLE OVER MARBLE?
083C:D0 05      62         BNE  DWNLFT     ;NO,IGNORE
083E:A9 06      63         LDA  #$6        ;PUT A SUPPOSED MARBLE
0840:9D 18 40   64         STA  TABLE+2,X ;     IN HOLE
0843:BD 21 40   65 DWNLFT  LDA  TABLE+11,X ;2ND DIRECTION
0846:F0 0A      66         BEQ  LEFT
0848:BD 2C 40   67         LDA  TABLE+22,X
084B:D0 05      68         BNE  LEFT
084D:A9 06      69         LDA  #$6
084F:9D 2C 40   70         STA  TABLE+22,X
0852:BD 20 40   71 LEFT    LDA  TABLE+10,X ;3RD DIRECTION
0855:F0 0A      72         BEQ  UPLEFT
0857:BD 2A 40   73         LDA  TABLE+20,X
085A:D0 05      74         BNE  UPLEFT
085C:A9 06      75         LDA  #$6
085E:9D 2A 40   76         STA  TABLE+20,X
0861:BD 15 40   77 UPLEFT  LDA  TABLE-1,X ;4TH DIRECTION
0864:F0 0A      78         BEQ  UPRGHT
0866:BD 14 40   79         LDA  TABLE-2,X
0869:D0 05      80         BNE  UPRGHT
086B:A9 06      81         LDA  #$6
086D:9D 14 40   82         STA  TABLE-2,X
0870:BD 0B 40   83 UPRGHT  LDA  TABLE-11,X ;5TH DIRECTION
0873:F0 0A      84         BEQ  RIGHT
0875:BD 00 40   85         LDA  TABLE-22,X
0878:D0 05      86         BNE  RIGHT
087A:A9 06      87         LDA  #$6
087C:9D 00 40   88         STA  TABLE-22,X
087F:BD 0C 40   89 RIGHT   LDA  TABLE-10,X ;6TH DIRECTION
0882:F0 0A      90         BEQ  SCANNED
0884:BD 02 40   91         LDA  TABLE-20,X
0887:D0 05      92         BNE  SCANNED
0889:A9 06      93         LDA  #$6
088B:9D 02 40   94         STA  TABLE-20,X
088E:A9 04      95 SCANNED LDA  #$4
0890:9D 16 40   96         STA  TABLE,X    ;MARBLE HAS BEEN EXAMINED
0893:4C 2B 08   97         JMP  SCAN       ;REPEAT, BEGINNING AT 1ST HOLE
0896:E0 61      98 NEXT    CPX  #$61       ;ALL HOLES SCANNED?
0898:F0 04      99         BEQ  DOWNR      ;YES
089A:E8        100         INX              ;NO,NEXT HOLE
089B:4C 2D 08  101         JMP  JUMP
089E:          102 * CHECK FOR 4 SINGLE MOVES
089E:A2 04     103 DOWNR   LDX  #$4        ;$#4=EXAMINED VALUE
08A0:A0 01     104         LDY  #$1        ;1ST CONTIGUOUS HOLE
08A2:B1 00     105         LDA(HOLE),Y     ;EMPTY?
08A4:D0 03     106         BNE  LEFTY      ;NO
08A6:8A        107         TXA
08A7:91 00     108         STA(HOLE),Y     ;EXAMINED
08A9:A0 0A     109 LEFTY   LDY  #$A        ;2ND CONT HOLE
08AB:B1 00     110         LDA(HOLE),Y
08AD:D0 03     111         BNE  DOWNL
08AF:8A        112         TXA
08B0:91 00     113         STA(HOLE),Y
08B2:A0 0B     114 DOWNL   LDY  #$B        ;3RD
08B4:B1 00     115         LDA(HOLE),Y
08B6:D0 03     116         BNE  RIGHTY
08B8:8A        117         TXA
08B9:91 00     118         STA(HOLE),Y
08BB:38        119 RIGHTY  SEC              ;4TH
08BC:A0 00     120         LDY  #$0
08BE:A5 00     121         LDA  HOLE
08C0:E9 0A     122         SBC  #$A
08C2:85 00     123         STA  HOLE
08C4:B1 00     124         LDA(HOLE),Y
08C6:D0 03     125         BNE  RESET
08C8:8A        126         TXA
08C9:91 00     127         STA(HOLE),Y
08CB:18        128 RESET   CLC
08CC:A5 00     129         LDA  HOLE       ;RESET HOLE AFTER SUB
08CE:69 0A     130         ADC  #$A
```

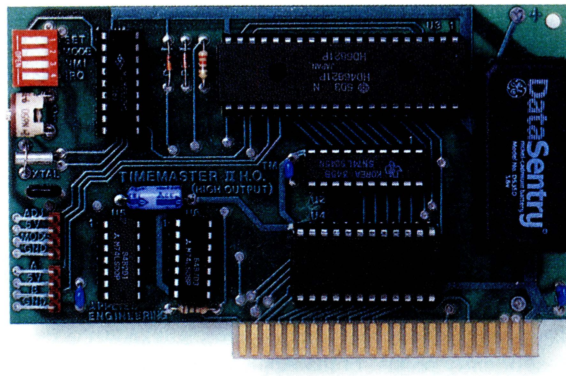
```
08D0:85 00      131         STA  HOLE
08D2:60         132         RTS
08D3:           133 *------------
08D3:           134 * EVALUATION
08D3:           135 *------------
08D3:A9 00      136 EVAL    LDA  #$0
08D5:8D 00 03   137         STA  NUMBER      ;RESET NUMBER OF MOVES
08D8:A8         138         TAY
08D9:B9 16 40   139 STARB   LDA  TABLE,Y     ;BUILD A SET OF MOVES
08DC:C9 04      140         CMP  #$4         ;POSSIBLE MOVE?
08DE:D0 13      141         BNE  NEXTY       ;NO
08E0:18         142         CLC
08E1:98         143         TYA
08E2:69 16      144         ADC  #$16
08E4:AE 00 03   145         LDX  NUMBER
08E7:9D 00 42   146         STA  STOR1,X     ;STORE MOVE
08EA:B9 16 41   147         LDA  TABV,Y
08ED:9D 50 42   148         STA  STOR2,X     ;STORE VALUE
08F0:EE 00 03   149         INC  NUMBER
08F3:C8         150 NEXTY   INY               ;ADVANCE ONE HOLE
08F4:C0 61      151         CPY  #$61        ;ALL HOLES DONE?
08F6:D0 E1      152         BNE  STARB       ;NO
08F8:A5 00      153         LDA  HOLE
08FA:85 02      154         STA  COMPBI      ;STORE EXAMINED ADDR
08FC:A2 00      155         LDX  #$0
08FE:A0 00      156         LDY  #$0
0900:38         157 NOTFINIS SEC
0901:BD 50 42   158         LDA  STOR2,X     ;PICK VALUE FROM EVAL TABLE
0904:F1 02      159         SBC  (COMPBI),Y  ;FIND DIFFERENCE
0906:30 13      160         BMI  INCRX       ;ELIMINATE BACKWARD JUMPS
0908:CD 01 03   161         CMP  LENGTH      ;BETTER THAN BEST SO FAR?
090B:90 0E      162         BCC  INCRX       ;NO
090D:8D 01 03   163         STA  LENGTH      ;YES,STORE ITS VALUE
0910:BD 00 42   164         LDA  STOR1,X
0913:8D 03 03   165         STA  TO          ;STORE (TO) ADDR
0916:A5 00      166         LDA  HOLE
0918:8D 02 03   167         STA  FROM        ;STORE (FROM) ADDR
091B:E8         168 INCRX   INX               ;NEXT POSSIBLE MOVE
091C:EC 00 03   169         CPX  NUMBER      ;ALL EXAMINED?
091F:D0 DF      170         BNE  NOTFINIS    ;NO
0921:A9 16      171         LDA  #$16        ;RESET COMPBI
0923:85 02      172         STA  COMPBI
0925:           173 *---------------
0925:           174 * RESTORE BOARD
0925:           175 *---------------
0925:A9 16      176         LDA  #$16
0927:85 3C      177         STA  A1L
0929:85 42      178         STA  A4L
092B:A9 43      179         LDA  #$43
092D:85 3D      180         STA  A1H
092F:85 3F      181         STA  A2H
0931:A9 76      182         LDA  #$76
0933:85 3E      183         STA  A2L
0935:A9 40      184         LDA  #$40
0937:85 43      185         STA  A4H
0939:A0 00      186         LDY  #$0
093B:20 2C FE   187         JSR  MOVE
093E:60         188         RTS
093F:           189 *----------------
093F:           190 * LEGALITY CHECK
093F:           191 *----------------
093F:20 46 09   192         JSR  STORE
0942:20 2D 08   193         JSR  JUMP
0945:60         194         RTS
0946:           195 *-------------
0946:           196 * STORE BOARD
0946:           197 *-------------
0946:A9 16      198 STORE   LDA  #$16
0948:85 3C      199         STA  A1L
094A:85 42      200         STA  A4L
094C:A9 40      201         LDA  #$40
094E:85 3D      202         STA  A1H
0950:85 3F      203         STA  A2H
0952:A9 76      204         LDA  #$76
0954:85 3E      205         STA  A2L
0956:A9 43      206         LDA  #$43
0958:85 43      207         STA  A4H
095A:A0 00      208         LDY  #$0
095C:20 2C FE   209         JSR  MOVE
095F:60         210         RTS
0960:           211 *--------------------
0960:           212 * START OF PROGRAM
0960:           213 *--------------------
0960:20 46 09   214         JSR  STORE
0963:20 03 08   215         JSR  LOOK
0966:60         216         RTS

*** SUCCESSFUL ASSEMBLY: NO ERRORS
```

END OF LISTING 3

```
              KEY PERFECT 5.0
                  RUN ON
                CHINESE.BIN
=======================================
  CODE-5.0    ADDR# - ADDR#    CODE-4.0
  --------    -------------    --------
  85E02E7C    0803 - 0852        2872
  2C2896F2    0853 - 08A2        257A
  C231D147    08A3 - 08F2        2728
  9DFC78FF    08F3 - 0942        2521
  BB0408A9    0943 - 0966        122A
  4C973360 = PROGRAM TOTAL =     0164
```


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Q.A. Ask Nibble!

by Roger Wagner

Q. How do you draw Applesoft shapes from assembly language?

A. One of the often overlooked tricks of assembly language programming on the Apple II is the technique of using the built-in subroutines that make up Applesoft BASIC. Since the actual functions of Applesoft are carried out by machine language subroutines, you can call these same subroutines from your own programs. Drawing shapes is a good example.

The key to doing this in your own programs is to know the specific addresses, or entry points, of the Applesoft subroutines. Some of the more important routines are in **Table 1**.

In addition, **Table 1** also lists certain zero page addresses that may be useful.

TABLE 1: Hi-Res Routine Entry Points

Name	Address	Function
HGR	$F3E2	Initializes system to Hi-Res page 1, clears screen to black.
HCOLOR	$F6F0	Sets Hcolor to contents of X-register (0-7).
HPOSN	$F411	Positions the Hi-Res "cursor." Accumulator (A) = vertical position; X-, Y-registers = low, high bytes of horizontal position.
HPLOT	$F457	Plots point at position. Uses Accumulator and X-, Y-registers like HPOSN.
HLIN	$F53A	Draws a line from the last point plotted to the specified position. Uses A,X (low, high) = horiz., Y = vertical.
SHNUM	$F730	Address of shape number in X-Register is returned in $1A,1B. Used before DRAW2 or XDRAW2.
DRAW2	$F605	Draws shape pointed to by $1A,1B at current "cursor" position in current Hcolor, using Rotation value in A (call SHNUM first).
XDRAW2	$F605	XDraws shape pointed to by $1A,1B at current "cursor" position in current Hcolor, using Rotation value in A (call SHNUM first).
ROT	$F9	Current Rotation value.
SCALE	$E7	Current Scale value.
SHPTR	$E8,E9	Pointer to current shape table.
X	$E0,E1	Current horiz. "cursor" position.
Y	$E2	Current vertical "cursor" position.

Roger Wagner is the president of Roger Wagner Publishing, Inc., the publisher of MouseWrite and the Merlin Assembler, and the author of Assembly Lines: The Book and Apple IIGS: Assembly Language for Beginners.

Send your questions about Apple programming and hardware to: Ask Nibble, *52 Domino Dr., Concord, MA 01742. We can't promise to answer all of them, but we're sure that you'll find a wealth of new information in the ones we publish!*

By using the above routines, you can do quite a variety of Hi-Res drawing from your own assembly language programs. **Listing 1** is a short program that clears the Hi-Res screen, draws a frame, and then moves a shape around on the screen as you press the arrow keys. Press the Escape key to quit the program.

LISTING 1: Shape Drawing Demo

```
                 1   ******************************
                 2   *    Shape Drawing Demo      *
                 3   *    Merlin 8/16 Assembler   *
                 4   ******************************
                 5
                 6             ORG   $8000
                 7
                 8   HGR       EQU   $F3E2
                 9   HCOLOR    EQU   $F6F0
                 10  HPOSN     EQU   $F411
                 11  HPLOT     EQU   $F457
                 12  HLIN      EQU   $F53A
                 13  SHNUM     EQU   $F730
                 14  XDRAW     EQU   $F661
                 15  SHPTR     EQU   $E8          ; $E8,E9
                 16  SCALE     EQU   $E7
                 17
                 18  TEXT      EQU   $FB39
                 19  KYBD      EQU   $C000
                 20  STROBE    EQU   $C010
                 21
                 22  XPOS      EQU   $06          ; $06,07 FOR US
                 23  YPOS      EQU   $08          ; $08 TOO...
                 24
                 25
8000: 20 E2 F3   26  START     JSR   HGR          ; CLEAR & SET HGR SCREEN
                 27
8003: A2 03      28            LDX   #$03         ; 3 = WHITE
8005: 20 F0 F6   29            JSR   HCOLOR       ; HCOLOR = WHITE
                 30
8008: A9 8C      31            LDA   #<140        ; LOW BYTE OF HORIZ. = 140
800A: 85 06      32            STA   XPOS
800C: A9 00      33            LDA   #>140        ; HI BYTE OF HORIZ. = 140
800E: 85 07      34            STA   XPOS+1       ; STARTING X
8010: A9 50      35            LDA   #80          ; VERTICAL = 80
8012: 85 08      36            STA   YPOS         ; STARTING Y
                 37
8014: A9 CF      38  SETTBL    LDA   #<TABLE      ; LOW BYTE OF SHAPE TABLE
8016: 85 E8      39            STA   SHPTR        ; APPLESOFT'S POINTER
8018: A9 80      40            LDA   #>TABLE      ; HIGH BYTE OF SHAPE TABLE
801A: 85 E9      41            STA   SHPTR+1
                 42
801C: A9 01      43            LDA   #1           ; SCALE = 1
801E: 85 E7      44            STA   SCALE
                 45
8020: A9 00      46  FRAME     LDA   #$00         ; Y = 0
8022: AA         47            TAX
8023: A8         48            TAY                ; X = 0
8024: 20 57 F4   49            JSR   HPLOT        ; HPLOT 0,0
                 50
8027: A9 17      51            LDA   #<279
8029: A2 01      52            LDX   #>279        ; X = 279
802B: A0 00      53            LDY   #0           ; Y = 0
802D: 20 3A F5   54            JSR   HLIN         ; HLIN FROM 0,0 TO 279,0
                 55
8030: A9 17      56            LDA   #<279
8032: A2 01      57            LDX   #>279        ; X = 279
8034: A0 9F      58            LDY   #159         ; Y = 159
8036: 20 3A F5   59            JSR   HLIN         ; HLIN FROM 279,0 TO 279,159
                 60
8039: A9 00      61            LDA   #<0
803B: A2 00      62            LDX   #>0          ; X = 0
803D: A0 9F      63            LDY   #159         ; Y = 159
803F: 20 3A F5   64            JSR   HLIN         ; HLIN FROM 279,159 TO 0,159
                 65
8042: A9 00      66            LDA   #<0
8044: A2 00      67            LDX   #>0          ; X = 0
8046: A0 00      68            LDY   #0           ; Y = 0
8048: 20 3A F5   69            JSR   HLIN         ; HLIN FROM 0,159 TO 0,0
                 70
804B: A6 06      71  POSN      LDX   XPOS         ; LOW BYTE OF HORIZ.
804D: A4 07      72            LDY   XPOS+1       ; HI BYTE OF HORIZ.
804F: A5 08      73            LDA   YPOS         ; VERTICAL
```

continued on page 122

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CIRCLE NUMBER 20

If you have the MicroSPARC Assembler and Macrosoft, enter the source code from **Listing 2**. Make sure that you've copied the file MACROSOFT 1.0.SOURCE to your Assembler disk. If you have version 3.0 of Macrosoft, change **line 13** of **Listing 2** to read USE MACROSOFT.3.O.S. Then assemble the program so that it produces the object file CIRCLE.

If you don't have The Assembler and Macrosoft, enter the hex code from **Listing 3** and save it with the command:

BSAVE CIRCLE,A$6000,L$35A

Finally, enter the demonstration program (**Listing 4**) and save it with the command:

SAVE CIRCLE.DEMO

For help with entering *Nibble* listings, see the Typing Tips section.

HOW IT WORKS

The easiest way to understand the algorithm is to study the BASIC version of the program (**Listing 1**). Then compare it to **Listing 2**. The labels beginning with L correspond to the BASIC line numbers in **Listing 1**.

THE **JANUARY 1988 DISK** CONTAINS THIS PROGRAM

If you'd rather not type in the listing for this program, you can buy it on disk, complete, free of typos and ready to run. *Nibble*'s January 1988 programs are available on a single disk for an introductory price of $12.95 from *Nibble*, 52 Domino Dr., Concord, MA 01742. Add $2.50 for shipping/handling within the U.S. and Canada; $7.50 for overseas air mail. Introductory price expires 3/31/88; after that date, the price will be $16.95. See the coupon on the last page of the Nibble Software Catalog for ordering information. **ORDER NO.: W03**


```
              KEY PERFECT 5.0
                  RUN ON
                BASIC.CIRCLE
 =====================================
   CODE-5.0    LINE# - LINE#    CODE-4.0
   --------    -------------    --------
   E9C604DC      10 -   100       5B68
   5B11F710     110 -   200       2D38
   784F91CA     210 -   300       2F4D
   5A7F2474     310 -   380       5242
   3848C29E = PROGRAM TOTAL =     0268
```

LISTING 1: BASIC.CIRCLE

```
10  REM   **********************
20  REM   * BASIC.CIRCLE       *
30  REM   * BY BRENT IVERSON   *
40  REM   * COPYRIGHT (C) 1988 *
50  REM   * BY MICROSPARC, INC *
60  REM   * CONCORD, MA  01742 *
70  REM   **********************
80  :
90  REM ---SET CIRCLE POSITION
100  REM    AND RADIUS
110  :
120 A = 140:B = 80:R = 70
130  :
140  REM ---CALL CIRCLE-GENERATOR
150  :
160  HGR : HCOLOR= 3
170  GOSUB 220
180  END
190  :
200  REM ---MAIN LOOP
210  :
220 X = 0:Y = R:D = 3 - 2 * R
230  GOSUB 370
240  IF D < 0 THEN D = D + 4 * X + 6: GOTO 26
     0
250 D = D + 4 * (X - Y) + 10:Y = Y - 1
260 X = X + 1
270  IF X < Y THEN 230
280  IF X = Y THEN  GOSUB 370
290  RETURN
300  :
310  REM ---HPLOT POINTS IN 8
320  REM    QUADRANTS. NOTE THAT
330  REM    NO CHECKING FOR
340  REM    SCREEN LIMITS IS
350  REM    EVER DONE!
360  :
370  HPLOT A + X,B + Y: HPLOT A + Y,B + X: HPLOT
     A + Y,B - X: HPLOT A + X,B - Y: HPLOT A -
     X,B - Y: HPLOT A - Y,B - X: HPLOT A - Y,
     B + X: HPLOT A - X,B + Y
380  RETURN
```

END OF LISTING 1

LISTING 2: Macrosoft Source Code for CIRCLE

```
 0 ;
 1 ;* CIRCLE
 2 ;* A HI-RES CIRCLE GENERATOR
 3 ;* BY BRENT IVERSON
 4 ;* COPYRIGHT (C) 1988
 5 ;* BY MICROSPARC, INC.
 6 ;* CONCORD, MA  01742
 7 ;
 8 ; USING: THE MICROSPARC ASSEMBLER/
 9 ;        MACROSOFT
10 ;
11 ;========================
12 ;
13          USE MACROSOFT 1.0
14          UEN
15          MUL
16 ;
17 ; LOCATED JUST ABOVE HI-RES PAGE 2
18 ;
19          BEGIN 24576
20 ;
21 ; VARIABLE DECLARATION - NOTE THAT
22 ; AA,BB, AND R ARE THE PARAMETERS
23 ; PASSED TO THIS ROUTINE
24 ;
25          VAR XX,YY,D,XC,YC,TEMP
26 ;
27 AA       EQU $300
28 BB       EQU $302
29 R        EQU $304
30 ;
31 ; XX=0: YY=R: D=3-(2*R)
32 ;
33 L220       LET XX=0
34            LET YY=R
35            MULT2 R
36            LET D=3-R
37 ;
38 L230       GOSUB L370
39 ;
40 L240       IF D>-1,GOTO L250
41 ;
42 ; D=D+(4*X)+6
43 ;
44            LET TEMP=XX
45            MULT2 TEMP
46            MULT2 TEMP
47            LET D=D+TEMP
48            LET D=D+6
49            GOTO L260
50 ;
51 ; D=D+4*(X-Y)+10: Y=Y-1
52 ;
53 L250       LET TEMP=XX-YY
54            MULT2 TEMP
55            MULT2 TEMP
56            LET D=D+TEMP
57            LET D=D+10
58            DECR YY
59 ;
60 ; XX=XX+1
61 ;
62 L260       INCR XX
63 L270       IF XX<YY,GOTO L230
64 L280       IF XX=YY,GOSUB L370
65            GOTO DONE
66 ;
67 ; PLOT POINTS IN 8 QUADRANTS
68 ;
69 L370       LET XC=AA+XX
70            LET YC=BB+YY
71            GOSUB PLOT
72 ;
73            LET XC=AA+YY
74            LET YC=BB+XX
75            GOSUB PLOT
76 ;
77            LET XC=AA+YY
78            LET YC=BB-XX
79            GOSUB PLOT
80 ;
81            LET XC=AA+XX
82            LET YC=BB-YY
83            GOSUB PLOT
84 ;
85            LET XC=AA-XX
86            LET YC=BB-YY
87            GOSUB PLOT
88 ;
89            LET XC=AA-YY
90            LET YC=BB-XX
91            GOSUB PLOT
92 ;
93            LET XC=AA-YY
94            LET YC=BB+XX
95            GOSUB PLOT
96 ;
```

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CIRCLE NUMBER 21

LISTING 2: CIRCLE Source *(continued)*

```
 97         LET XC=AA-XX
 98         LET YC=BB+YY
 99         GOSUB PLOT
100  ;
101         RETURN
102  ;
103  ; IF POINT XC,YC IS WITHIN SCREEN
104  ; LIMITS, CALL APPLESOFT HPLOT
105  ; ROUTINE TO PLOT IT IN THE
106  ; CURRENT HCOLOR
107  ;
108 PLOT    IF XC>279,RETURN
109         IF XC<Ø,RETURN
110         IF YC>191,RETURN
111         IF YC<Ø,RETURN
112         HPLOT XC,YC
113         RETURN
114  ;
115  ; EXIT THIS ROUTINE
116  ;
117 DONE    END
```

END OF LISTING 2

LISTING 3: CIRCLE

```
6ØØØ- AD 59 AA 48 A5 D9 48 A5
6ØØ8- 76 48 A5 B8 48 A5 B9 48
6Ø1Ø- A9 Ø2 85 76 A9 FF 85 D9
6Ø18- A9 BF 85 33 A9 ØØ 85 F3
6Ø2Ø- 4C 2F 6Ø 4C 2F 4C 2F 4C
6Ø28- 2F 4C 2F 4C 2F 4C 2F A9
6Ø3Ø- 23 85 85 A9 6Ø AØ ØØ A2
6Ø38- ØB 2Ø 3F 63 A9 ØØ 8D 23
6Ø4Ø- 6Ø A9 ØØ 8D 24 6Ø AD Ø4
6Ø48- Ø3 8D 25 6Ø AD Ø5 Ø3 8D
6Ø5Ø- 26 6Ø ØE Ø4 Ø3 2E Ø5 Ø3
6Ø58- 38 A9 Ø3 ED Ø4 Ø3 8D 27
6Ø6Ø- 6Ø A9 ØØ ED Ø5 Ø3 8D 28
6Ø68- 6Ø 2Ø 58 61 AD 28 6Ø 48
6Ø7Ø- 49 FF 1Ø Ø5 68 3Ø 15 1Ø
6Ø78- 1Ø 68 C9 FF 3Ø ØE DØ Ø9
6Ø8Ø- AD 27 6Ø C9 FF 9Ø Ø5 FØ
6Ø88- Ø3 4C CB 6Ø AD 23 6Ø 8D
6Ø9Ø- 2D 6Ø AD 24 6Ø 8D 2E 6Ø
6Ø98- ØE 2D 6Ø 2E 2E 6Ø ØE 2D
6ØAØ- 6Ø 2E 2E 6Ø 18 AD 27 6Ø
6ØA8- 6D 2D 6Ø 8D 27 6Ø AD 28
6ØBØ- 6Ø 6D 2E 6Ø 8D 28 6Ø 18
6ØB8- AD 27 6Ø 69 Ø6 8D 27 6Ø
6ØCØ- AD 28 6Ø 69 ØØ 8D 28 6Ø
6ØC8- 4C 19 61 38 AD 23 6Ø ED
6ØDØ- 25 6Ø 8D 2D 6Ø AD 24 6Ø
6ØD8- ED 26 6Ø 8D 2E 6Ø ØE 2D
6ØEØ- 6Ø 2E 2E 6Ø ØE 2D 6Ø 2E
6ØE8- 2E 6Ø 18 AD 27 6Ø 6D 2D
6ØFØ- 6Ø 8D 27 6Ø AD 28 6Ø 6D
6ØF8- 2E 6Ø 8D 28 6Ø 18 AD 27
61ØØ- 6Ø 69 ØA 8D 27 6Ø AD 28
61Ø8- 6Ø 69 ØØ 8D 28 6Ø AD 25
611Ø- 6Ø DØ Ø3 CE 26 6Ø CE 25
6118- 6Ø EE 23 6Ø DØ Ø3 EE 24
612Ø- 6Ø AD 24 6Ø 48 4D 26 6Ø
6128- 1Ø Ø5 68 3Ø 12 1Ø 13 68
613Ø- CD 26 6Ø 3Ø ØA DØ ØB AD
6138- 23 6Ø CD 25 6Ø BØ Ø3 4C
614Ø- 69 6Ø AD 23 6Ø CD 25 6Ø
6148- DØ ØB AD 24 6Ø CD 26 6Ø
615Ø- DØ Ø3 2Ø 58 61 4C 25 63
6158- 18 AD ØØ Ø3 6D 23 6Ø 8D
616Ø- 29 6Ø AD Ø1 Ø3 6D 24 6Ø
6168- 8D 2A 6Ø 18 AD Ø2 Ø3 6D
617Ø- 25 6Ø 8D 2B 6Ø AD Ø3 Ø3
6178- 6D 26 6Ø 8D 2C 6Ø 2Ø A1
618Ø- 62 18 AD ØØ Ø3 6D 25 6Ø
6188- 8D 29 6Ø AD Ø1 Ø3 6D 26
619Ø- 6Ø 8D 2A 6Ø 18 AD Ø2 Ø3
6198- 6D 23 6Ø 8D 2B 6Ø AD Ø3
61AØ- Ø3 6D 24 6Ø 8D 2C 6Ø 2Ø
61A8- A1 62 18 AD ØØ Ø3 6D 25
61BØ- 6Ø 8D 29 6Ø AD Ø1 Ø3 6D
61B8- 26 6Ø 8D 2A 6Ø 38 AD Ø2
61CØ- Ø3 ED 23 6Ø 8D 2B 6Ø AD
61C8- Ø3 Ø3 ED 24 6Ø 8D 2C 6Ø
61DØ- 2Ø A1 62 18 AD ØØ Ø3 6D
61D8- 23 6Ø 8D 29 6Ø AD Ø1 Ø3
61EØ- 6D 24 6Ø 8D 2A 6Ø 38 AD
61E8- Ø2 Ø3 ED 25 6Ø 8D 2B 6Ø
61FØ- AD Ø3 Ø3 ED 26 6Ø 8D 2C
61F8- 6Ø 2Ø A1 62 38 AD ØØ Ø3
62ØØ- ED 23 6Ø 8D 29 6Ø AD Ø1
62Ø8- Ø3 ED 24 6Ø 8D 2A 6Ø 38
621Ø- AD Ø2 Ø3 ED 25 6Ø 8D 2B
6218- 6Ø AD Ø3 Ø3 ED 26 6Ø 8D
622Ø- 2C 6Ø 2Ø A1 62 38 AD ØØ
6228- Ø3 ED 25 6Ø 8D 29 6Ø AD
623Ø- Ø1 Ø3 ED 26 6Ø 8D 2A 6Ø
6238- 38 AD Ø2 Ø3 ED 23 6Ø 8D
624Ø- 2B 6Ø AD Ø3 Ø3 ED 24 6Ø
6248- 8D 2C 6Ø 2Ø A1 62 38 AD
625Ø- ØØ Ø3 ED 25 6Ø 8D 29 6Ø
6258- AD Ø1 Ø3 ED 26 6Ø 8D 2A
626Ø- 6Ø 18 AD Ø2 Ø3 6D 23 6Ø
6268- 8D 2B 6Ø AD Ø3 Ø3 6D 24
627Ø- 6Ø 8D 2C 6Ø 2Ø A1 62 38
6278- AD ØØ Ø3 ED 23 6Ø 8D 29
628Ø- 6Ø AD Ø1 Ø3 ED 24 6Ø 8D
6288- 2A 6Ø 18 AD Ø2 Ø3 6D 25
629Ø- 6Ø 8D 2B 6Ø AD Ø3 Ø3 6D
6298- 26 6Ø 8D 2C 6Ø 2Ø A1 62
62AØ- 6Ø AD 2A 6Ø 48 49 Ø1 1Ø
62A8- Ø5 68 3Ø 13 1Ø 1Ø 68 C9
62BØ- Ø1 3Ø ØC DØ Ø9 AD 29 6Ø
62B8- C9 17 9Ø Ø3 FØ Ø1 6Ø AD
62CØ- 2A 6Ø 48 49 ØØ 1Ø Ø5 68
62C8- 3Ø 1Ø 1Ø ØF 68 C9 ØØ 3Ø
62DØ- Ø9 DØ Ø8 AD 29 6Ø C9 ØØ
62D8- BØ Ø1 6Ø AD 2C 6Ø 48 49
62EØ- ØØ 1Ø Ø5 68 3Ø 13 1Ø 1Ø
62E8- 68 C9 ØØ 3Ø ØC DØ Ø9 AD
62FØ- 2B 6Ø C9 BF 9Ø Ø3 FØ Ø1
62F8- 6Ø AD 2C 6Ø 48 49 ØØ 1Ø
63ØØ- Ø5 68 3Ø 1Ø 1Ø ØF 68 C9
63Ø8- ØØ 3Ø Ø9 DØ Ø8 AD 2B 6Ø
631Ø- C9 ØØ BØ Ø1 6Ø AD 2B 6Ø
6318- AE 29 6Ø AC 2A 6Ø 2Ø 11
632Ø- F4 2Ø 5A F4 6Ø 68 85 B9
6328- 68 85 B8 68 85 76 68 85
633Ø- D9 68 8D 59 AA A9 8D 8D
6338- Ø1 Ø2 A9 Ø1 85 34 6Ø 85
634Ø- 86 84 87 AØ ØØ A9 ØØ 91
6348- 85 C8 DØ Ø2 E6 86 8A DØ
635Ø- Ø4 C6 87 3Ø Ø4 CA 4C 45
6358- 63 6Ø
```

END OF LISTING 3

```
           KEY PERFECT 5.Ø
               RUN ON
               CIRCLE
==========================================
  CODE-5.Ø    ADDR# - ADDR#    CODE-4.Ø
  --------    -------------    --------
  E1DF6ØCC     6ØØØ - 6Ø4F       2833
  B51B416B     6Ø5Ø - 6Ø9F       29DØ
  99445326     6ØAØ - 6ØEF       2716
  2A93DC43     6ØFØ - 613F       2746
  39FF5AF4     614Ø - 618F       22A2
  67C2ADØA     619Ø - 61DF       281C
  69915D97     61EØ - 622F       2D14
  D4CE2373     623Ø - 627F       2BØC
  2B112Ø4A     628Ø - 62CF       253E
  1BEDF2AØ     62DØ - 631F       232F
  4A6333CE     632Ø - 6359       1EØ5
  66E4B1BE = PROGRAM TOTAL =     Ø35A
```

LISTING 4: CIRCLE.DEMO

```
10  REM  **********************
20  REM  * CIRCLE.DEMO        *
30  REM  * BY BRENT IVERSON   *
40  REM  * COPYRIGHT (C) 1988 *
50  REM  * BY MICROSPARC, INC *
60  REM  * CONCORD, MA  01742 *
70  REM  **********************
80  HOME : ONERR  GOTO 590
90  PRINT  CHR$ (4)"BLOAD CIRCLE": POKE 216,0
100 :
110  REM ---FUNCTIONS A & B
120  REM    GET THE HI & LO BYTES
130  REM    OF THEIR ARGUMENTS
140  REM    ...NUMBERS >=0 ONLY!
150 :
160  DEF  FN A(T) = (T / 256 -  INT (T / 256)
     ) * 256
170  DEF  FN B(T) =  INT (T / 256)
180 :
190  REM ---CLEAR SCREEN, SET
200  REM    CENTER OF CIRCLE AT
210  REM    CENTER OF SCREEN
220 :
230  HGR
240 X = 140:Y = 80
250 :
260  REM ---MAIN LOOP
270 :
280  FOR R = 0 TO 160 STEP 20
290 :
300  REM ---GET RANDOM, NON-BLACK
310  REM    HCOLOR
320 :
330 HC =  INT ( RND (1) * 7) + 1: IF HC = 0 OR
     HC = 4 THEN 330
340  HCOLOR= HC
350 :
360  REM ---GOSUB CIRCLE-CALLING
370  REM    SUBROUTINE
380 :
390  GOSUB 540
400  NEXT
410  IF  PEEK ( - 16384) < 128 GOTO 280
420  TEXT : END
430 :
440  REM ---END OF MAIN LOOP
450 :
460 :
470  REM ---POKE THE LO & HI
480  REM    BYTES OF THE
490  REM    PARAMETERS FOR
500  REM    THE CIRCLE ROUTINE
510  REM    WHERE IT EXPECTS
520  REM    THEM, THEN CALL IT.
530 :
540  POKE 768, FN A(X): POKE 769, FN B(X)
550  POKE 770, FN A(Y): POKE 771, FN B(Y)
560  POKE 772, FN A(R): POKE 773, FN B(R)
570  CALL 24576
580  RETURN
590 E =  PEEK (222):EL =  PEEK (218) + 256 *
      PEEK (219): CALL  - 3288: POKE 216,0
600  HOME : VTAB 12: IF E = 6 OR E = 7 THEN  PRINT
     "CIRCLE FILE NOT ON THIS DISK": GOTO 630
610  IF E = 8 THEN  PRINT "I/O ERROR--CHECK D
     RIVE DOOR": GOTO 630
620  PRINT "ERROR "E" IN LINE "EL: END
630  PRINT "RETURN TO TRY AGAIN, ESCAPE TO QU
     IT";: GET Z$: PRINT : ON Z$ <  >  CHR$ (
     27) GOTO 80: END
```

END OF LISTING 4

KEY PERFECT 5.0
RUN ON
CIRCLE.DEMO

CODE-5.0	LINE# - LINE#	CODE-4.0
DE7B3141	10 - 100	5C1F
044310C9	110 - 200	548C
5C5E6912	210 - 300	3597
2DCE956E	310 - 400	367A
31C1FEFB	410 - 500	36D1
CC3B80D3	510 - 600	6808
43CFE50C	610 - 630	3A43
C16DFC28	= PROGRAM TOTAL =	046A

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by Daniel L. Joynt

METEOROIDS

This arcade-style maneuvering game can be entered in only two BASIC lines.

You are the sole pilot of an intergalactic patrol craft, skimming across the surface of an unexplored alien planet. Suddenly, a meteor storm engulfs the small world in a fury of flying rock. You scramble at the controls, and your ship dodges nimbly the onslaught of meteors. Without warning, again, your viewscreen fills with towering, ragged mountain peaks that threaten to swallow up your tiny craft. All the on-screen excitement of this Hi-Res arcade game is yours — in the time it takes to type two lines of Applesoft code.

USING THE PROGRAM

In the cockpit of your Apple, you use the A and Z keys to move your ship up and down, respectively. The ship continues in the direction you select until you press another key. Press the space bar for level flight. To begin each mission, simply RUN Meteoroids. The game will end after a fatal crash or collision, and your final score will be displayed at the bottom of the screen. Any score above 6,000 is spectacular. See **Figure 1** for an example of the game's display.

ENTERING THE PROGRAM

The two Applesoft lines (**Listing 1**) have been crammed so full of code that no more characters can be entered. When you type them in, after the Applesoft input prompt, ignore all spaces. Also, replace the PRINT statement in **line 20** with a question mark (?). By following these suggestions, both lines can be entered within the Apple's input line limit of 239 characters.

Be sure to double-check all DATA items after typing them in. A mistake here could produce disastrous results in the graphics animation or in the game shapes themselves. For help with entering Meteoroids, see the One- and Two-Liner Winners page and the Typing Tips section. Save the program with the command:

SAVE METEOROIDS

Listing 2 contains an expanded version of the game, including helpful REMarks. If you have entered **Listing 1**, there is no need to enter **Listing 2** unless you want to modify the game. If you decide to type it in, save it with the command:

SAVE METEOROIDS.EXP

Listing 3 contains the short machine language program that is included in **Listing 1**. There is no need to type it in.

FIGURE 1: Meteoroids in progress

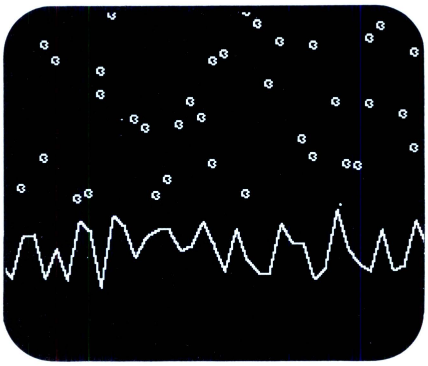


TABLE 1: Variables

Variable	Function
Y	Y-coordinate of your ship
S	Difficulty factor (determines height of mountains and your final score)
L	Last mountain peak Y-coordinate
N	New mountain peak Y-coordinate
Q	Dummy variable used to click the speaker
K	Data variable
A$	Input variable

HOW THE PROGRAM WORKS

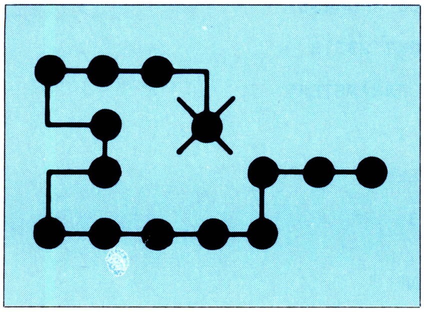
The real workhorse of the program is the short (34-byte) machine language routine POKEd into memory from DATA statements. It does most of the animation, including moving all of the meteors and scrolling the landscape. It also erases all the objects as they move off the left edge of the screen.

Listing 3 is a commented disassembly of the subroutine. It starts by loading zero page locations $26 and $27 with the high and low bytes of the upper-left corner of the Hi-Res screen. These two locations ($26 and $27) are known to Applesoft as the "on-the-fly" base address for the internal Hi-Res cursor. Applesoft uses them to point to where any drawing should be done on the Hi-Res screens.

The Y-Register is next loaded with a zero (LDY #$00) to point to column zero, the left edge of the screen. Before it's used as an index in indirect indexing, the Y-Register is incremented (INY) one position.

Daniel L. Joynt, 5783 Lake Avenue, White Bear Lake, MN 55110. Meteoroids runs under either DOS 3.3 or ProDOS.

FIGURE 2: Shape 1 (Ship)

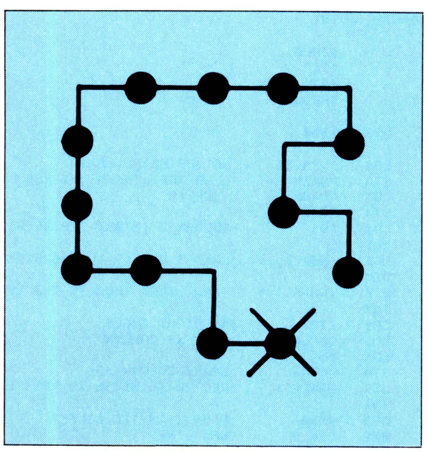


The statement LDA ($26), Y loads the accumulator with the byte on the Hi-Res screen at the address pointed to by $26 and $27. The Y-Register is an index to the appropriate column. It's then decremented (DEY) to move back to its former value. Next, the byte in the accumulator is stored back into memory (STA ($26),Y) at the column just left of the one previously loaded. This is why the Y-Register was first incremented and then decremented.

To make forward progress across the Hi-Res screen, the Y-Register is again incremented (INY). It's compared to 39 (CPY #$27) to see if it has reached the right edge of the screen. If it hasn't, then the program loops back (BNE $030A) to continue on the same Hi-Res screen line. If the screen line has been finished (Y=$27), the accumulator is next loaded with a zero (LDA #$00). This value is then stored on the screen (STA ($26),Y) to clear or erase what was previously in column 39, which makes room for new objects to be drawn on the screen.

Next, the program jumps (JSR $F504) to an undocumented entry point into Applesoft ROM. Applesoft will now increment the internal cursor position, $26 and $27, to point to the base address of the next line down the screen. This ROM subroutine returns without affecting the X- or Y-Registers. The X-Register is then incremented (INX) and compared with 160 (CPX #$A0), determining whether all 160 upper lines of the Hi-Res screen have been scrolled left. If they have not, then the program loops back (BNE $0308) to start work on a new line. If all lines have been scrolled, the subroutine finally returns to Applesoft via an RTS statement. Amazingly, this all takes mere microseconds!

FIGURE 3: Shape 2 (Meteor)



Back to BASIC

For a simpler explanation of the Applesoft portions of Meteoroids, let's concentrate on the expanded listing (**Listing 2**). The data for the scroll routine and the shape table are first POKEd into memory in **lines 80-90. Lines 480-530** contain the scroll routine data. **Lines 570-600** contain the data for the two shapes used in the program. These two shapes, a ship and a meteor, are shown graphically in **Figures 2 and 3.** An X indicates where the shape starts and heavy dots indicate points to be plotted. The thin lines show the path used to create each shape.

Line 130 POKEs the address of the shape table into memory. It's located in memory at $0322 (802), directly following the scroll routine. **Line 170** presets the rotation and scale of the shapes. This is required by Applesoft before they can be drawn properly. **Lines 210-240** clear the Hi-Res screen and text window, set HCOLOR equal to three, and indicate the movement keys. Next, the variables are initialized in **line 280**. These are listed, along with their functions, in **Table 1**.

The game will end after a fatal crash or collision, and your final score will be displayed at the bottom of the screen.

The heart of the Applesoft program is contained in the main loop in **line 320**, which has been kept as a single line in order to maintain the execution speed. Let's examine it statement by statement. Variable K first receives a value from the keyboard register (K = PEEK (49152)). This value is used to increment or decrement variable Y if K equals 218 or 193 (Y = Y + (K = 218) − (K = 193). These values correspond to keys Z and A, respectively. Next, the speaker is clicked (Q = PEEK (49200)) for the sound effects. A new meteor is drawn in column 39 at a random height (DRAW 2 at 278, RND(1) * S). This value is also dependent on the variable S to prevent a meteor from appearing from within a mountain peak. Variable S is next decreased by .25 (S = S = .25) * (S > Q) and prevented from falling below zero. It's then used to determine a new random mountain peak (N = S + RND (1) * 40).

A line is drawn from the new value of N to its former value contained in variable L (HPLOT 272,L to 279,N). The result is a new mountain peak or valley. Note that L is plotted exactly seven pixels to the left of N. This is because the landscape has been scrolled to the left one column (or seven pixels) since the last HPLOT. L is then set equal to N (L = N) to maintain a continuous mountain range. The scroll routine is called next (CALL 768) before the ship is drawn in column zero (DRAW 1 at 3,Y). The collision counter (memory location 234) will be set to a value greater than zero if the ship has been drawn on top of something, indicating a collision. This value is checked before looping back to **line 320** (ON NOT PEEK (234) GOTO 320).

If the value of location 234 is greater than zero, the ON GOTO statement will fall through to **line 360**, where the final score is calculated from variable S. It's printed (PRINT (120 − S) * 100) and the program then inquires if the user wants to play again. If the answer is "Y" (Yes), then the game restarts at **line 210**.

Since space is limited, there's no check to determine if the ship has strayed off the top or bottom of the screen. However, you'll find that it's impossible to fly your ship off the screen bottom without crashing into a mountain.

You may also have noticed the lack of statements to erase objects. The scroll routine automatically does all of the erasing. When objects are scrolled to column zero, new screen bytes are placed on top of them. This results in nearly flicker-free animation.

MODIFICATIONS

Meteoroids is just begging to be modified. Here are several possible changes you can make.

1. Modify the scroll routine. Make it faster by using a lookup table instead of JSR $F504 to find the base address of each Hi-Res screen line. Make it scroll right instead of left, or add a wrap-around effect.
2. Change the shapes. You can make them larger, add more of a variety, or add an explosion shape.
3. Change the control mode to use a paddle instead of the keyboard
4. Prevent the ship from leaving the screen.
5. Add more sound effects by creating explosions and engine sounds.
6. Change the difficulty factor. Make the game easier or more difficult by increasing or decreasing the change in S (S = S − .1).
7. Start the mountain range at a different height by changing the starting value of S in **line 260** (S = 100).
8. Change the mountain shapes. Make the mountains more rugged (N = S + RND (1) * 60) or make them smoother (N = S + RND (1) * 20).
9. Add a Save High Score feature.

LISTING 1: METEORIODS

```
10  FOR Y = 768 TO 826: READ K: POKE Y,K: NEXT
    : POKE 232,34: POKE 233,3: ROT= 0: SCALE=
    1: HGR : HCOLOR= 3: HOME : VTAB 21:Y = 1
    20:S = Y:L = 159: DATA 169,32,133,39,162
    ,0,134,38,160,0,200,177,38,136,145,38,20
    0,192,39,208,245,169,0,145,38,32,4,245,2
    32,224,160,208,231,96,2,0
20 K =  PEEK (49152):Y = Y + (K = 218) - (K =
    193):Q =  PEEK (49200): DRAW 2 AT 278, RND
    (1) * S:S = S - .25:N = S +  RND (1) * 4
    0: HPLOT 272,L TO 279,N:L = N: CALL 768:
     DRAW 1 AT 3,Y: ON  NOT  PEEK (234) GOTO
    20: PRINT (120 - S) * 100: DATA 6,0,15,0
    ,28,63,14,190,45,45,44,37,0,63,56,36,12,
    45,21,23,21,4,0
```

END OF LISTING 1

```
              KEY PERFECT 5.0
                  RUN ON
                METEOROIDS
=====================================
   CODE-5.0    LINE# - LINE#    CODE-4.0
   --------    -------------    --------
   743D6B29      10 -    20       BD71
   743D6B29 = PROGRAM TOTAL =     018C
```

LISTING 2: METEROIDS.EXP

```
10  REM  *********************
20  REM  * METEOROIDS.EXP    *
30  REM  * BY DANIEL JOYNT   *
40  REM  * COPYRIGHT (C) 1988 *
50  REM  * BY MICROSPARC, INC *
60  REM  * CONCORD, MA  01742 *
70  REM  *********************
80  FOR Y = 768 TO 826
90  READ K: POKE Y,K: NEXT Y
100  REM
110  REM  SHAPE TABLE ADDRESS
120  REM
130  POKE 232,34: POKE 233,3
140  REM
150  REM  SET SHAPE PARAMETERS
160  REM
170  ROT= 0: SCALE= 1
180  REM
190  REM  CLEAR SCREEN
200  REM
210  HGR : HCOLOR= 3
220  HOME : VTAB 22
230  PRINT "(A) UP"
240  PRINT "(Z) DOWN"
250  REM
260  REM  INITIALIZE VARIABLES
270  REM
280 Y = 120:S = Y:L = 159
290  REM
300  REM  MAIN LOOP
310  REM
320 K =  PEEK (49152):Y = Y + (K = 218) - (K =
     193):Q =  PEEK (49200): DRAW 2 AT 278, RND
     (1) * S:S = S - .25 * (S > 0):N = S +  RND
     (1) * 40: HPLOT 272,L TO 279,N:L = N: CALL
     768: DRAW 1 AT 3,Y: ON  NOT  PEEK (234) GOTO
     320
330  REM
340  REM  PRINT SCORE
350  REM
360  HOME : VTAB 21
370  PRINT "SCORE: ";
380  PRINT (120 - S) * 100
390  PRINT
400  PRINT "ANOTHER GAME (Y/N)";
410  POKE  - 16368,0
420  INPUT A$
430 A$ =  LEFT$ (A$,1)
440  IF A$ = "Y" THEN 210
450  REM
460  REM  SCROLL ROUTINE DATA
470  REM
480  DATA  169,32,133,39,162,0
490  DATA  134,38,160,0,200,177
500  DATA  38,136,145,38,200
510  DATA  192,39,208,245,169,0
520  DATA  145,38,32,4,245,232
530  DATA  224,160,208,231,96
540  REM
550  REM  SHAPES DATA
560  REM
570  DATA  2,0,6,0,15,0
580  DATA  28,63,14,190,45,45
590  DATA  44,37,0,63,56,36
600  DATA  12,45,21,23,21,4,0
```

END OF LISTING 2

LISTING 3: HIRES.SCROLL

Note: This code already exists as part of Listing 1. There is no need to enter it.

```
                 1    * MACHINE LANGUAGE ROUTINE
                 2    *  FROM METEOROIDS
                 3    *  BY DANIEL JOYNT
                 4    *
                 5    PAGE1    =     $2000
                 6    HBASL    =     $26
                 7    HBASH    =     $27
                 8    HGRDECY  =     $F504
                 9    *
                 10            ORG   $300
                 11   *
0300: A9 20      12            LDA   #>PAGE1     ;SET UP HBASL,HBASH
0302: 85 27      13            STA   HBASH       ; FOR TOP LINE OF HI-RES
0304: A2 00      14            LDX   #PAGE1      ; SCREEN
0306: 86 26      15            STX   HBASL
0308: A0 00      16   LINLP    LDY   #0          ;COLUMN 0 (FIRST 7 PIXELS)
030A: C8         17   COLLP    INY
030B: B1 26      18            LDA   (HBASL),Y   ;LOAD 7 PIXELS TO THE RIGHT
030D: 88         19            DEY
030E: 91 26      20            STA   (HBASL),Y   ; AND STORE THEM TO THE LEFT
0310: C8         21            INY
0311: C0 27      22            CPY   #$27        ;AT RIGHT EDGE?
0313: D0 F5      23            BNE   COLLP       ;DO NEXT COLUMN
0315: A9 00      24            LDA   #0
0317: 91 26      25            STA   (HBASL),Y   ;ERASE COLUMN 39
0319: 20 04 F5   26            JSR   HGRDECY     ;DEC HBASL,HBASH TO NEXT LINE
031C: E8         27            INX
031D: E0 A0      28            CPX   #$A0        ;DONE WITH 160 LINES?
031F: D0 E7      29            BNE   LINLP       ;NEW LINE
0321: 60         30            RTS
```

END OF LISTING 3

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DSAD

by Mark Cornick

MINIMENU

Choose the file you want to run just by entering a number.

This short subroutine will help you streamline program selection under ProDOS. MiniMenu presents you with a list of file names from any ProDOS disk. After you select one, the program will execute it for you.

USING THE PROGRAM

The program will display a full 80-column screen (see **Figure 1**) with the name of your disk, the number of blocks free, used and a total, a numbered list of file names, and a prompt asking for the number of the file to run. Simply type a number to run a program.

MiniMenu makes a perfect startup file (one that will be run automatically when the computer is turned on). To use it this way, save it under the name **STARTUP**. To use it as a subroutine in a program of your own, simply include a GOTO 10000. *Note:* Unlike most subroutines, you use a GOTO and not a GOSUB to execute it. You could use GOSUB, but there is no RETURN statement, so the GOSUB is meaningless. Using GOTO will also save a few bytes of memory, since a RETURN line isn't necessary.

ENTERING THE PROGRAM

This program requires an Apple IIc, IIGS, or an Apple IIe with an 80-column card. It can also be adapted to work on an Apple II Plus with an 80-column card and lower-case capability (see Modifications section). MiniMenu works only under ProDOS. Because of the techniques used, it will not work under DOS 3.3.

To enter MiniMenu type in the Applesoft code shown in **Listing 1**. When you are done, save it on disk with the command:

SAVE MINI.MENU

For help with entering the *Nibble* listings, see the Typing Tips section.

HOW IT WORKS

The program has only 10 lines and the lines are numbered over 9999. Since line numbers in most programs rarely go over 9999, it can be appended to most programs without fear of erasing lines that already exist. If this arrangement causes problems, you can renumber either your program or this subroutine using a utility like Double-Take from Beagle Bros or GALE from MicroSPARC.

Lines 10000-10020 check for a IIe, IIc, or IIGS; ProDOS; and an 80-column card, respectively. The program will stop if one of these conditions is not met.

Mark Cornick, 1423 Forest Ridge Rd., Charlottesville, VA 22903. MiniMenu requires ProDOS and an Apple IIc, IIGS, or IIe with an 80-column card.

Lines 10030 and 10040 read in the file names from disk. This is accomplished by OPENing the directory and INPUTting one catalog entry at a time into the array A$( ). There is room for 51 file names in A$( ), the same number that will fit in a ProDOS main volume directory. As soon as an entry begins with "BLOCKS" MiniMenu knows it has reached the end of the file names, and the directory is closed. (See reference 1 for my source of inspiration on this technique.)

Lines 10040-10070 print the numbers from 1 to 51 on the screen and the file names associated with each. Note that there may not be a file name for every number. In particular, the higher numbers are usually blank, and in some cases the first entry is blank. If you select a "blank number" you are asked to select again.

Line 10080 prompts for the number of the file to run and gives you the option to quit. Entering Q will send you to **line 10090** to end the program. If you enter the number of a file that exists, that program will be run. Other input will be screened out. The program uses the dash (—) command to run programs, and therefore only file types BAS, BIN, TXT, and SYS can be run from this program. Any other selection — a subdirectory for example — will result in an error. For those unfamiliar with the dash command, it will RUN a BAS (BASIC) program, BRUN a BIN (binary) program, EXEC a TXT (ASCII text) file, and execute a SYS (system) file. (See reference 2.)

FIGURE 1: Sample Screen

```
/TEST/
BLOCKS FREE: 121         BLOCKS USED: 159  TOTAL BLOCKS: 280
-------------------------------------------------------------
1  PRODOS                17                33                49
2  BASIC.SYSTEM          18                34                50
3  CONVERT               19                35                51
4  FILER                 20                36
5  MINI.MENU             21                37
6  MINI                  22                38
7                        23                39
8                        24                40
9                        25                41
10                       26                42
11                       27                43
12                       28                44
13                       29                45
14                       30                46
15                       31                47
16                       32                48

ENTER NUMBER TO RUN OR Q TO QUIT
```

MODIFICATIONS

The program can be modified to run on a II Plus that has an 80-column card and 64K of memory. Follow these steps:

1. Delete **lines 10000 and 10020.**
2. Replace POKE 1403,*x* throughout the program with POKE 36, *x*.
3. Replace the CHR$(21) in **line 10080** with CHR$(26);"1"
4. Add :PRINT CHR$(12):HOME after the "PR#3" in **line 10050.**

If you make this modification, the program will not check for an 80-column card. The check used in this program only works on IIe's and IIc's. If you know a way to check for your particular card, by all means put this check in the program to ensure proper operation.

If your 80-column card is not in slot 3, substitute your slot number in the PR# statement in **line 10050**. Most 80-column cards are in slot 3 or the IIe auxiliary slot (which is wired to slot 3), so this shouldn't pose a problem.

I used RamWorks II from Applied Engineering on a IIe when writing this program. On RamWorks II (also the Apple extended 80-column card and the original RamWorks), POKE 1403,*x* positions the cursor at column *x* on the screen, with *x* between 0 and 79. If your card requires a different command, substitute it throughout the program.

The program can be modified in many different ways. One modification might be to add subdirectory capability. This could be accomplished by interpreting numeric input as the number of the program to run and text input as the name of a new prefix. In this way, you could not only handle subdirectories, but also switch between fixed disks, such as the RAM disk that comes with extended memory and hard disks. You can also use the program as an actual subroutine by changing the END statement in **line 10090** to RETURN.

REFERENCES

1. Mossberg, Sandy. "The CAT and CATALOG Commands." *Nibble*, May 1986, p. 114.
2. Kersey, Bert, and Bill Sanders. *The Big Tip Book.* New York: Bantam Books, 1986.

LISTING 1: MINI.MENU

```
10000  IF  PEEK (64435) <  > 6 THEN  PRINT "N
      OT //E OR //C": END
10010  IF  PEEK (48640) <  > 76 THEN  PRINT "
      NOT PRODOS": END
10020  HOME : POKE 49153,0: POKE 49237,0: POKE
      1024,123:Z =  PEEK (1024) <  > 123: POKE
      49236,0: POKE 49152,0: IF Z THEN  PRINT
      "NO 80-COLUMN CARD": END
10030  CLEAR :S = 4: DIM A$(100):D$ =  CHR$ (
      4): PRINT D$"PREFIX": INPUT P$: PRINT D$
      "OPEN"P$",TDIR": PRINT D$"READ"P$
10040 X = X + 1: INPUT A$(X): ON  LEFT$ (A$(X
      ),6) <  > "BLOCKS" GOTO 10040: PRINT D$"
      CLOSE":FB$ = A$(X):LN = X - 2: FOR A = 4
       TO LN:A$(A) =  MID$ (A$(A),2,15): NEXT
      : FOR A = LN + 1 TO 100:A$(A) = "": NEXT

10050  PRINT D$"PR#3": PRINT P$: PRINT FB$: FOR
      D = 1 TO 80: PRINT "-";: NEXT : FOR X =
      4 TO 19
10060  PRINT X - 3;" ";A$(X): NEXT : VTAB 4: FOR
      X = 20 TO 35: POKE 1403,20: PRINT X - 3;
      " ";A$(X): NEXT
10070  VTAB 4: FOR X = 36 TO 51: POKE 1403,40
      : PRINT X - 3;" ";A$(X): NEXT : VTAB 4: FOR
      X = 52 TO 54: POKE 1403,60: PRINT X - 3;
      " ";A$(X): NEXT
10080  VTAB 21: CALL  - 868: INPUT "ENTER NUM
      BER TO RUN OR Q TO QUIT ";N$: ON N$ = "Q
      " GOTO 10090:X =  VAL (N$): ON X < 1 OR
      X > 51 GOTO 10080: ON A$(X + 3) = "" GOTO
      10080: PRINT  CHR$ (21): HOME : PRINT D$
      "-";A$(X + 3)
10090  END
```

END OF LISTING 1

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by Jeff Hurlburt

SUPER HI-RES PICTURE PACKER

This utility will save you a large amount of disk storage space, and provide for easy picture handling within Applesoft programs.

The stunning graphics on the Apple IIGS have popularized paint programs, but there's a price paid in disk space for a collection of pictures — Super Hi-Res color and detail add up to 65 disk blocks per picture. As tempting as the thought of an art gallery on disk may be, it's tempered by the need for economical storage.

Enter Super Pac, a program that displays, compresses, and re-expands Super Hi-Res picture files on any Apple IIGS. Some full-screen pictures can be compressed into as few as 11 blocks, which is an 83 percent saving of disk space. You can also pack and unpack any rectangular area within the picture, so you can animate your artwork by redrawing specific portions of the screen.

Super Pac loads and displays packed and unpacked screens and saves them in three formats. Files whose names end in .PS include packed picture data and "picture suffix" information, like palettes. Files whose names end in .PD have packed picture data without the suffix information. Files without any special ending are standard non-packed, Super Hi-Res files listed with a type of $C1 in a disk catalog.

Although some paint programs, including Paintworks Plus and Deluxe Paint II, pack their picture files, Super Pac does even better, generally saving another one or two blocks per picture, and sometimes as many as five or six.

USING THE PROGRAM

The Applesoft interface for Super Pac must fit into a fairly small area of memory, so some special conditions are required to use the program. The program requires that all Super Hi-Res picture files be in a ProDOS subdirectory named PIC.FILES. No other type of files should be in the subdirectory. Also, keep the Caps Lock key down when using the program.

Jeff Hurlburt, 7814 Santa Elena, Houston, TX 77061. Super Pac requires an Apple IIGS and ProDOS.

When you run Super Pac, you can choose any of 10 options shown on the screen using the Up- and Down-Arrow keys (see **Figure 1**). Choosing Load Pic or Delete brings up a menu from which you can select both packed and unpacked picture files. Be careful with the DELETE option — once you press Return the file is gone. The Disp option switches on the Super Hi-Res display and shows the currently loaded picture. CLS clears the screen. Cat Pics shows the contents of the current PIC.FILES directory, where your picture files must be located, and Cat Vol shows the volume-level directory of the current diskette.

The ProDOS menu option permits entry of other disk commands. To enter a command that contains a comma, type in an apostrophe (') in place of the comma. The program will substitute a comma for the apostrophe before processing the command.

Other commands include Update List, which updates Super Pac's menu after you switch disks or issue a ProDOS command; Save Unpacked, which saves the Super Hi-Res screen as a standard, full-size $C1-type file; and Pack and Save.

FIGURE 1: MAIN MENU

```
SUPER PAC-(C) 1988
by MicroSPARC Inc.

    LOAD PIC
    DISP
    CLS
    PACK & SAVE
    SAVE UNPACKED
    UPDATE LIST
    DELETE
    CAT VOL
    CAT PICS
    PRODOS
    END
```

Pack and Save works on the picture currently in display memory. When you select it, you must first decide whether or not the palette data and other suffix information should be included in the packed file. If you'll be using the same palette for a series of pictures, press N for no; otherwise, press Y for yes to create a stand-alone file.

Next, you're asked if you want to pack and save the entire picture. If you press Y, the program will pack and save the Super Hi-Res display and return you to the main menu. If you press N, Super Pac will ask you to enter a new name for the portion of the default screen you want to save. It then shows you the default screen coordinates it will save and prompts you to enter new values.

It initially displays the values 0, 159, 0 and 199, which are the borders of the Super Hi-Res screen. (Because Super Pac can only

accept screen coordinates that occur on byte boundaries, horizontal screen coordinates are given as byte offsets from zero rather than pixel offsets. For example, in 320 × 200 mode, a pixel at 100,100 would be entered as 50,100; in 640 × 200 mode, a pixel at 440,100 would be entered as 110,100.) These are the values of the start and end of the X coordinate, and the start and end of the Y coordinate. The input prompt represents these as XS, XE, YS, and YE. Enter four new values all on one line with a command between each.

Once you've selected an area of the screen, Super Pac shows you that area and, after a keypress, the length of the newly packed file. If you're satisfied, the selected area is packed and saved; if not, it displays the coordinates you've selected and lets you repeat the procedure.

After you've saved the packed screen or portion to disk, Super Pac will return to the main menu so you can work on another picture.

Due to space limitations, Super Pac's error handling is necessarily minimal. If an error occurs, Super Pac will display the menu option you were attempting and the error number. Pressing Return will get you back to the main menu. If you choose an option by mistake or change your mind, pressing Return without an entry in response to a prompt will usually give you another chance.

ENTERING THE PROGRAM

Super Pac requires ProDOS on an Apple IIGS. The program consists of six files. Enter the Applesoft program in **Listing 1** and save it on disk with the command:

SAVE SUPER.PAC

Be sure not to enter any extra spaces, since the program uses almost all available memory. If your opening screen does not look like **Figure 1**, then there are too many extra characters or added lines in the program.

If you have the ORCA/M assembler, enter the source code for **Listings 2, 4,** and **6** and assemble them with the file names SP.FACE, SP.PUP, and SP.DRD, respectively. If you do not have the ORCA/M assembler, enter the Monitor with CALL −151 and key in the hex code for **Listing 3**. Save the file with the command:

BSAVE SP.FACE,A$300,L$A4

Key in the hex code from **Listing 5** and save the file with the command:

BSAVE SP.PUP,A$9010,L$1EA

Key in the hex code from **Listing 7** and save the file with the command:

BSAVE SP.DRD,A$8EE7,L$81

The sample programs that demonstrate how to use the pack and unpack routines in your own programs are **Listings 8** and **9**. **Listing 8** requires that you have a Super Hi-Res picture on disk with the name PICTURE, and **Listing 9** assumes that you have run **Listing 8**.

Enter the Applesoft program in **Listing 8** and save it to disk with the command:

SAVE PACK.EXAMPLE

Enter the Applesoft program in **Listing 9** and save it to disk with the command:

SAVE UNPACK.EXAMPLE

For help with entering *Nibble* listings, see the Typing Tips section.

HOW SUPER PAC WORKS

Super Pac consists of a ProDOS BASIC program called SUPER.PAC, and three assembly language programs which do most of the work: SP.PUP, which contains the packing and unpacking routines; SP.FACE, which serves as an interface between the BASIC program and SP.PUP; and SP.DRD, which reads the directory to look for picture files and helps assemble them into a menu. Although Super Pac is a stand-alone program, you can use the packing and unpacking routines in SP.PUP in other applications you might write.

A full-screen Super Hi-Res picture has two parts: picture data, the acutal 160 × 200 byte block of pixels, and the picture suffix. The suffix contains up to 16 color palettes, scanline control bytes, and other information to help decide which of the 4,096 possible colors each pixel will be.

To reduce images, Super Pac looks for repetitions of screen bytes within Super Hi-Res picture data. For example, an entirely green screen would consist of 32,000 bytes with a value of $55, where each 5 means "display a green dot." A packer would compress this picture by producing the instruction "repeat $55 32,000 times." If $01 is the code that tells Super Pac to repeat, then "01 55 00 7D" replaces the 32,000 bytes of picture information. The unpacking routines simply decode these instructions.

Of course, virtually all picture files are much more complex than that. When you call the Pack routine, it does some housekeeping, sets the area to be packed to the full screen, and resets pointers. It then scans the picture to find a byte to use as the "repeat" instruction. Rather than use the same value each time for the repeat instruction, Pack scans each picture for unused or rarely used values, and creates a unique repeat instruction for each picture.

Having chosen the repeat instruction byte, Pack creates a prefix which includes the screen area, the repeat byte, and the format byte, and then begins to compress the picture. The packed picture, beginning with the prefix, is stored at $1000 in bank $00. (See **Table 1**.)

continued on page 83

TABLE 1: Packed Picture Specifications

Packed Picture Format

Picture Prefix:	$00/1000-$100F
Packed Data:	$00/1010-. . .
Suffix:	$300 bytes following packed pic data (optional)

Picture Prefix Format

$00/1000: XS XE YS YE RB PF LL LH xx xx xx xx xx xx xx xx

Variable Name	Function
XS: X Start	sets left side of packed pic
XE: X End	sets right side (XE-1) of packed pic
YS: Y Start	sets top of packed pic
YE: Y End	sets bottom (YE-1) of packed pic
RB: Repeat Byte	byte which stands for "repeat" instruction
PF: Packing Fmt. Byte	tells whether or not pic suffix appended
LL/LH: Packed Length	length of the packed picture including prefix and packed pic data but not suffix (2 bytes)
xx: uncommited	not assigned, available to user

TABLE 2: Memory Usage

Program Name	Segment Function	Segment Location
SUPER.PAC	BASIC program	$00/0800-0FFF
	BASIC variables, strings	$00/9200-94FF
SP.FACE	interface	$00/0300-03A3
SP.PUP	PACK and UNPACK	$00/9000-91F9
SP.DRD	DIRectory file reader	$01/9500-9567
	pic I/O & .DIR read	$00/1000-900F
	pic cropper temp pic hold	$01/1000-8FFF
	display/unpacked pic	$E1/2000-9FFF

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continued from page 79

Instead of scanning lines in the picture, Pack scans successive columns, beginning in the upper-left corner of the area to be packed and moving from left to right. Most pictures show more differentiation horizontally than vertically, so vertical scanning frequently produces longer runs of repeated bytes.

As it scans, Pack encodes non-repeated bytes and runs of fewer than four as they are. Longer runs are coded with the repeat byte, the byte to repeat, and the number of repeats, to a maximum of 255 times. For instance, if $A3 is the repeat byte, then "33 33 4B A3 11 FF A3 11 51" translates as "display two $33s, a $4B, 255 $11s and then 81 more $11s."

What happens if the repeat byte occurs in the display? Since this happens very rarely, there is only small loss in coding "A3 A3 01," which is interpreted by the unpacker routine as "repeat the repeat byte once."

Pack wraps things up by calculating the length of the packed display, saving this information in the prefix, and then checking to see if the palette and other suffix information should be appended, that is, whether you requested .PD or .PS format. If the packing format byte is an ASCII "S", Pack copies the 768-byte suffix from the source picture to the end of the packed picture data.

Although Unpack need only follow Pack's instructions, it must be fast enough for immediate screen updating. Unpack generally takes about one-half second to display a full screen, updating smoothly from left to right. Unpack first looks at the prefix and sets up pointers. It then checks the picture format byte, moving the picture suffix to the appropriate area, if necessary, and unpacks the packed data.

Unpacking time depends less on the amount of packed data than on the size of the unpacked graphic. When the packed picture takes up less than the full screen, unpack time is proportionately reduced, to about 18 milliseconds for a 32-by-32-pixel section. This makes Unpack fast enough for animation such as blinking eyes or talking mouths.

I wrote SP.DRD after discovering how annoying it was to have to catalog a volume, remember a file name, and type it in to get at a picture file. SP.DRD BRUNs at $8EE7, where it moves the directory read routines out of harm's way into bank $01 at $9500. (See **Table 2**.) SP.DRD places the contents of a directory file into a string array.

Some full-screen pictures can be compressed into as few as 11 blocks, which is an 83 percent saving in disk space.

Super Pac calls SP.DRD on booting and whenever a file is saved or deleted. It reads all the file names in the PIC.FILES subdirectory, where the program expects to find your graphics files, whether packed or unpacked. When you want to load or delete a picture file, SP.DRD lists the file names and allows you to choose one by number.

Both Pack and Unpack use $9000 as the direct (zero) page during execution, with bytes $10-$31 used as counters, pointers, and general scratchpad areas. Both routines expect to find a pointer to the start of non-packed picture storage at $9010 and a pointer to the start of packed picture storage at $9013. *Note:* these two pointers, preset to $E1/2000 and $00/1000, respectively, are part of the SP.PUP file.

You may employ the 65816 microprocessor in either native or emulation mode while using these routines in your own programs. They execute in native mode, and switch to emulation mode with the direct page set to $0000 and the data bank register set to $00 upon exit. When called, the routines look for the packing boundaries XS, XE, YS, and YE at $00/0003-0006 and a packing format byte at $00/0008. Unpack also expects to find the repeat byte at $00/0007.

Unpack lets you place a packed graphic — for example, an object in an adventure game — somewhere other than its original screen location when it was packed, as long as the original *ranges* are preserved. A screen region originally at 0,32,0,32 might be unpacked at 50,82,110,142. Finally, direct calls to Pack or Unpack should be preceded with either a POKE 49193,65 (display off) or POKE 49193,193 (display on) to ensure that linear display mapping is active.

CUSTOMIZATION

SUPER.PAC provides access to SP.PUP's picture manipulation functions. While the program is only 2K long, it's still about as large as it could be without modifications best accomplished in expanded RAM. (If you decide to modify SUPER.PAC, check Applesoft's end-of-program pointer at $00/00AF-00B0 to be sure that it doesn't overwrite the packed picture storage space at $00/1000.)

You can also pack and unpack any rectangular area within a picture, so you can animate your artwork by redrawing specific portions of the screen.

You can use both the packing and unpacking routines independently in your own programs. You'll use Unpack anywhere you want to use your packed graphics, of course. You might build the packing routines into more elaborate picture-processing utilities.

PACK.EXAMPLE (**Listing 8**) shows how to use the pack routines in a program. A short machine language routine is POKEd into memory to move a BLOADed picture to display memory. It assumes that you have a Super Hi-Res picture named PICTURE on the disk along with SP.PUP (**Listing 3**.)

UNPACK.EXAMPLE (**Listing 9**) shows how to unpack a packed Super Hi-Res program from within Applesoft. It assumes you have previously run PACK.EXAMPLE in **Listing 8**.

THE **JANUARY 1988 DISK** CONTAINS THIS PROGRAM

If you'd rather not type in the listing for this program, you can buy it on disk, complete, free of typos and ready to run. *Nibble*'s January 1988 programs are available on a single disk for an introductory price of $12.95 from *Nibble*, 52 Domino Dr., Concord, MA 01742. Add $2.50 for shipping/handling within the U.S. and Canada; $7.50 for overseas air mail. Introductory price expires 3/31/88; after that date, the price will be $16.95. See the coupon on the last page of the Nibble Software Catalog for ordering information. **ORDER NO.: W03**

LISTING 1: SUPER.PAC

```
10  REM SUPER.PAC/J.Hurlburt/(c)1988 By Micro
    SPARC Inc.
20  LOMEM: 37376:D$ =  CHR$ (4):B$ = D$ + "BL
    OAD": PRINT D$"PR#3": HOME : PRINT D$"BR
    UNSP.DRD": PRINT B$"SP.FACE": DIM P$(50)
    ,T$(1),C$(10): FOR I = 0 TO 50:P$(I) = "
    ": NEXT :F = 10: FOR I = 0 TO F: READ C$
    (I): NEXT :T$(0) = "$C1":T$(1) = "BIN"
30 Z$ = "PIC.FILES/":P = 4096:B = 854:H = 778
    :J = 879:Q = 787:S = 5:E = S + F: PRINT
    B$"SP.PUP": GOSUB 420: ONERR  GOTO 430
40 PC = S:Q$ = "": HOME:PRINT
50  VTAB S - 2: PRINT "SUPER PAC-(C) 1988 by
    MicroSPARC Inc.": PRINT : FOR I = 0 TO F
    : IF PC = I + S THEN  INVERSE
```

```
60  PRINT " "C$(I)" ": NORMAL : NEXT : CALL H
     :K =  PEEK (49152): IF K = 10 THEN PC =
     (PC < E) * (PC + 1) + (PC = E) * S
70   IF K = 11 THEN PC = (PC > S) * (PC - 1) +
     (PC = S) * E
80   IF K <  > 13 THEN 50
90 C = PC - S: ON C + 1 GOSUB 270,100,110,130
     ,410,420,270,390,380,330,120: GOTO 40
100  CALL 844: RETURN
110  CALL J:P$ = "": RETURN
120  HOME : PRINT D$"PREFIX/": PRINT "END": POP
     : END
130  HOME : VTAB 5: PRINT C$(C)" "P$: PRINT "
     with SUFFIX";: GOSUB 250:R$ = "S": IF Q$
      = "N" THEN R$ = "D"
140  PRINT : PRINT C$(C)" all "P$;: GOSUB 250
     :I = 1:XS = 0:XE = 160:YS = 0:YE = 200: IF
     Q$ <  > "N" THEN I = 0: GOTO 170
150  PRINT "NAME";: GOSUB 230: PRINT :P$ = Q$
160  PRINT XS,XE,YS,YE: PRINT : INPUT "INPUT
     XS,XE,YS,YE: ";XS,XE,YS,YE: IF XS >  = X
     E OR XE > 160 OR YS >  = YE OR YE > 200 THEN
      RETURN
170  POKE 3,XS: POKE 4,XE: POKE 5,YS: POKE 6,
     YE: POKE 8,83: CALL 872:Z =  PEEK (P + 6
     ) +  PEEK (P + 7) * 256 + (R$ = "S") * 7
     68
180  IF I THEN  CALL Q + 12: CALL J: CALL B: CALL
     Q + 8: PRINT : PRINT "LEN= "Z" BYTES. OK
     ";: GOSUB 250: IF Q$ = "N" THEN  HOME : GOTO
     160
190  GOSUB 360: IF U THEN P$ =  LEFT$ (P$,L -
     1) + R$: GOTO 220
200  IF L > 12 THEN P$ =  LEFT$ (P$,12)
210 P$ = P$ + ".P" + R$
220  POKE P + 5, ASC (R$): PRINT D$"BSAVE"Z$P
     $",A$1000,L";Z: GOSUB 420: RETURN
230  INPUT ": ";Q$: IF Q$ = "" THEN  POP
240  RETURN
250  PRINT "? (Y/N): ";: GET Q$: PRINT Q$: IF
      ASC (Q$) = 13 THEN  POP
260  RETURN
270  HOME : FOR I = 0 TO N STEP 3: FOR D = 0 TO
     2: PRINT "["; SPC( I + D < 10);I + D;"]
      ";P$(I + D); SPC( (D <  > 2) * (20 -  LEN
     (P$(I + D))));: ON (P$(I + D + 1) = "x")
      GOTO 280: NEXT : PRINT : NEXT : GOTO 29
     0
280 I = N:D = 2: NEXT : NEXT
290  PRINT : PRINT C$(C);"#";: GOSUB 230:I =
      VAL (Q$):M =  ASC (Q$): IF I > N OR M <
     48 OR M > 57 THEN  RETURN
300 P$ = P$(I): IF C THEN  PRINT D$C$(C)Z$P$:
      GOSUB 420: RETURN
310  GOSUB 360: PRINT B$Z$P$",T"T$(U)",A$1000
     ": IF U THEN  CALL B: RETURN
320  CALL 841: RETURN
330  VTAB 20:E$ = "": PRINT "CMD (' for comma
     )";: GOSUB 230
340  FOR I = 1 TO  LEN (Q$):N$ =  MID$ (Q$,I,
     1): IF N$ = "'" THEN N$ = ","
350 E$ = E$ + N$: NEXT : PRINT D$E$: GOSUB 40
     0: RETURN
360 U = 0:L =  LEN (P$): IF L > 3 THEN U = ( LEFT$
     ( RIGHT$ (P$,3),2) = ".P")
370  RETURN
380 Q$ = Z$
390  HOME : PRINT D$"CATALOG"Q$
400  PRINT "PRESS RETURN";: CALL H: PRINT : RETURN

410  HOME : PRINT C$(C)" "P$" as";: GOSUB 230
     : CALL Q + 4: PRINT D$"CREATE"Z$Q$",T$C1
     ": PRINT D$"BSAVE"Z$Q$",T$C1,A$1000,L$80
     00":P$ = Q$
420  PRINT B$Z$",TDIR,A$1000": CALL 912:N =  PEEK
     (4133): FOR I = 0 TO 2:P$(N + I) = "x": NEXT
     :N = N - 1: FOR I = 0 TO N:P$(I) = P$(I)
      + "": NEXT : RETURN
430  CALL 917: TEXT : HOME : PRINT C$(C)" ERR
     OR " PEEK (222): CALL H: GOTO 40
440  DATA LOAD PIC,DISP,CLS,PACK & SAVE,SAVE
     UNPACKED,UPDATE LIST,DELETE,CAT VOL,CAT
     PICS,PRODOS,END
```

END OF LISTING 1

```
               KEY PERFECT 5.0
                   RUN ON
                  SUPER.PAC
=====================================
  CODE-5.0   LINE# - LINE#   CODE-4.0
  --------   -------------   --------
  9F767683     10 -   100     0112CA
  6C9A19C2    110 -   200       DC4C
  9533CD06    210 -   300       AA4B
  10D0FDA3    310 -   400       7C49
  35E6296A    410 -   440       9439
  5D632C18 = PROGRAM TOTAL =    079C
```

LISTING 2: SP.FACE Source Code

```
  1 *         SP.FACE
  2 *         by Jeff Hurlburt
  3 *         Copyright 1988 by MicroSPARC, Inc.
  4 *         Concord, MA  01742
  5 *
  6 *         Orca/M Assembler
  7 *
  8 *         KEEP    SP.FACE         (LINK SP.FACE KEEP=SP.FACE)
  9           ORG     $0300
 10 SPFACE    START
 11           ABSADDR ON
 12           OBJ     $0300
 13 VCR       EQU     $C029
 14 KEY       EQU     $C000
 15 KEYCLR    EQU     $C010
 16 PBLK0     EQU     $1000
 17 DBLK      EQU     $E12000
 18 PRMSV     EQU     $0003
 19 UNPACK    EQU     $9093
 20 PACK      EQU     $913E
 21 XNATIVE   EQU     $9032
 22 SUFFIX    EQU     $9D00
 23 DRD       EQU     $019500
 24 ONERR     EQU     $DF
 25           65816   ON
 26           LONGA   OFF
 27           LONGI   OFF
 28 LINDISP   LDA     #$41
 29           BPL     NOSHOW
 30 SHOW      LDA     #$C1
 31 NOSHOW    STA     VCR
 32           RTS
 33 KEYREAD   LDA     KEY             <CALL KP>
 34           BPL     KEYREAD
 35           LDA     KEYCLR
 36           RTS
 37 MV00_E1   LDX     #$00            <CALL MV>
 38           BRA     DOMOVE
 39 MVE1_00   LDX     #$01
 40           BRA     DOMOVE
 41 MV01_E1   LDX     #$02
 42           BRA     DOMOVE
 43 MVE1_01   LDX     #$03
 44 DOMOVE    JSR     LINDISP
 45           CLC
 46           XCE
 47           REP     #$30
 48           LONGA   ON
 49           LONGI   ON
 50           LDA     D_S,X
 51           STA     MVINST0+1
 52 DM2       LDX     #PBLK0
 53           LDY     #|DBLK
 54           AND     #$00FF
 55           CMP     #$00E1
 56           BEQ     LMACC
 57           TXA
 58           TYX
 59           TAY
 60 LMACC     LDA     #$7FFF
 61 MVINST0   MVN     0,0
 62           JSR     XNATIVE
 63           RTS
 64           LONGA   OFF
 65           LONGI   OFF
 66 MV_DISP   JSR     MV00_E1         <CALL MP>
 67 DISP      JSR     SHOW            <CALL DP>
 68 UPEX      JSR     KEYREAD
 69           JSR     LINDISP
 70           RTS
 71 UNPK_DR   LDX     #$05            <CALL UP>
 72 GETPRM    LDA     PBLK0,X
 73           STA     PRMSV,X
 74           DEX
 75           BPL     GETPRM
 76           JSR     SHOW
 77           JSR     UNPACK
 78           BRA     UPEX
 79 PACK_DR   JSR     LINDISP         <CALL PK>
 80           JSR     PACK
 81           RTS
 82 CLRSCRN   JSR     SHOW            <CALL CS>
 83           CLC
 84           XCE
 85           REP     #$30
 86           LONGA   ON
 87           LONGI   ON
 88           LDA     #$0000
```

```
 89         STA     DBLK
 90         LDA     #$7DC6
 91         LDX     #!DBLK
 92         LDY     #!DBLK+1
 93         MVN     DBLK,DBLK
 94         JSR     XNATIVE
 95         JSR     LINDISP
 96         RTS
 97 GODRD   JSL     DRD                     <CALL RD>
 98         RTS
 99         PLA                             <CALL ER>
100         TAY
101         PLA
102         LDX     ONERR
103         TXS     A
104         PHA
105         TYA     A
106         PHA
107         RTS
108 D_S     DC      H'E100E101'
109         DC      H'E1'
110         END
```

END OF LISTING 2

```
            KEY PERFECT 5.0
                RUN ON
                SP.FACE
=====================================
 CODE-5.0   ADDR# - ADDR#    CODE-4.0
 --------   -------------    --------
 66A7BE43    0300 - 034F        238B
 620F4F87    0350 - 039F        2452
 DB798DB8    03A0 - 03A3        019B
 22949F0D = PROGRAM TOTAL =       A4
```

LISTING 3: SP.FACE

```
0300- A9 41 10 02 A9 C1 8D 29
0308- C0 60 AD 00 C0 10 FB AD
0310- 10 C0 60 A2 00 80 0A A2
0318- 01 80 06 A2 02 80 02 A2
0320- 03 20 00 03 18 FB C2 30
0328- BD 9F 03 8D 43 03 A2 00
0330- 10 A0 00 20 29 FF 00 C9
0338- E1 00 F0 03 8A BB A8 A9
0340- FF 7F 54 00 00 20 32 90
0348- 60 20 13 03 20 04 03 20
0350- 0A 03 20 00 03 60 A2 05
0358- BD 00 10 95 03 CA 10 F8
0360- 20 04 03 20 93 90 80 E7
0368- 20 00 03 20 3E 91 60 20
0370- 04 03 18 FB C2 30 A9 00
0378- 00 8F 00 20 E1 A9 C6 7D
0380- A2 00 20 A0 01 20 54 E1
0388- E1 20 32 90 20 00 03 60
0390- 22 00 95 01 60 68 A8 68
0398- A6 DF 9A 48 98 48 60 E1
03A0- 00 E1 01 E1
```

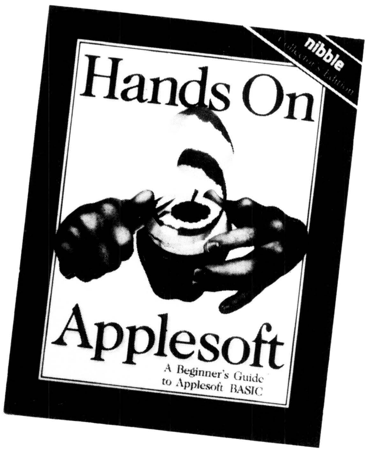
END OF LISTING 3

LISTING 4: SP.PUP Source Code

```
  1 *           SP.PUP PACKER/UNPACKER
  2 *           by Jeff Hurlburt
  3 *           Copyright 1988 by MicroSPARC, Inc.
  4 *           Concord, MA   01742
  5 *
  6 *           Orca/M assembler
  7 *
  8 *           UNPACK BEGINS AT $9093/ CALL 37011
  9 *           PACK BEGINS AT $913E/ CALL 37182
 10 *
 11 *           KEEP    SP.PUP      (LINK SP.PUP,KEEP=SP.PUP)
 12             ORG     $9010
 13 SPPUP       START
 14             ABSADDR ON
 15             OBJ     $9010
 16 DP          EQU     $9000
 17 PARMS       EQU     $0003
 18 DISPSFX     EQU     $9D00
 19 CNTPG       EQU     $2000
 20 PBLKST      EQU     $10
 21 PPBLKST     EQU     $13
 22 VLINSV      EQU     $16
 23 TEMP        EQU     $17
 24 PICSTRT     EQU     $18
 25 PICPTR      EQU     $1A
 26 PPICPTR     EQU     $1D
 27 VLIN        EQU     $20
 28 XS          EQU     $21
 29 XE          EQU     $22
 30 YS          EQU     $23
 31 YE          EQU     $24
 32 PFX         EQU     $25
 33 PFBYTE      EQU     $26
 34 SVPTRS      EQU     $28
 35 LPIC        EQU     $E12000
 36 LPPIC       EQU     $001000
 37             DC      H'0020E1'       *SCRATCHPAD AREA IS $10-$31 IN DIRECT PAGE.
 38             DC      H'001000'       *1ST 6 BYTES ARE PIC & PACKED PIC POINTERS.
 39             DC      28H'00'         *THE REMAINING 28 BYTES BEGIN = $00.
 40             65816   ON
 41             LONGA   OFF
 42             LONGI   OFF
 43 XNATIVE     REP     #$20            *EXIT NATIVE MODE WITH DIRECT PG= $0000
 44             LONGA   ON
 45             LDA     #$0000          *AND DATA BANK REG= $00
 46             TCD
 47             SEP     #$30
 48             LONGA   OFF
 49             LDA     #$00
 50             PHA
 51             PLB
 52             SEC
 53             XCE
 54             RTS
 55 PUPSTRT     CLC                     *SET NATIVE MODE WITH DIRECT PG= $9000
 56             XCE
 57             SEP     #$30
 58             REP     #$20
 59             LONGA   ON
 60             LDA     #DP
 61             TCD
 62             SEP     #$30
 63             LONGA   OFF
 64 SETUP       LDX     #$05            *MOVE PARMS FROM $00/0003-$0008 TO NEW
 65 LDPB        LDA     PBLKST,X        * DIRECT PAGE AND SETUP POINTERS IN
 66             STA     PICPTR,X        * SCRATCHPAD AREA
 67             LDA     |PARMS,X
 68             STA     XS,X
 69             DEX
 70             BPL     LDPB
 71             CLC
 72             LDA     PPICPTR
 73             ADC     #$10
 74             STA     PPICPTR
 75             BCC     NOC0
 76             INC     PPICPTR+1
 77 NOC0        REP     #$20
 78             LONGA   ON
 79             LDA     YS
 80             AND     #$00FF
 81             ASL     A
 82             STA     TEMP
 83             ASL     A
 84             ASL     A
 85             CLC
 86             ADC     TEMP
 87             ASL     A
 88             ASL     A
 89             ASL     A
 90             ASL     A
 91             ADC     PBLKST
 92             STA     TEMP
 93             LDA     XS
 94             AND     #$00FF
 95             ADC     TEMP
 96             STA     PICSTRT
 97             STA     PICPTR
 98             SEP     #$21
 99             LONGA   OFF
100             LDA     YE
101             SBC     YS
102             STA     VLIN
103             STA     VLINSV
104             RTS
105 UNPACK      JSR     PUPSTRT         *PICTURE UNPACKER
106             LDA     PFBYTE
107             CMP     #$53
108             BNE     NOSUFFX
109             REP     #$31
110             LONGA   ON
111             LONGI   ON
112             LDY     #$0006
113             LDA     [PPBLKST],Y
114             ADC     PPBLKST
115             TAX
116             LDY     #DISPSFX
117             LDA     #$02FF
118 UMVSUFX     MVN     LPPIC,LPIC
119             SEP     #$30
120             LONGA   OFF
121             LONGI   OFF
122 NOSUFFX     LDY     #$00            *MAIN UNPACK ROUTINE
123             BRA     GETPPB
124 WR_ONE      STA     [PICPTR],Y      WRITE PIC BYTE TO DISPLAY
125             DEC     VLIN            DEC VERTICAL LINE COUNT
126             BEQ     DONEWC1
127             CLC
128             LDA     PICPTR          *UPDATE PICTURE POINTER
129             ADC     #$A0            INC TO NEXT LINE
130             STA     PICPTR
131             BCC     GETPPB
132             INC     PICPTR+1
133 GETPPB      LDA     [PPICPTR],Y     GET BYTE FROM PACKED PIC
134             CMP     PFX             = REPEAT PFX?
135             BEQ     WR_MANY         YES? THEN DO MULTI WRITE
136             INC     PPICPTR         NO, UPDATE PACKED PIC PTR FOR SINGLE WRITE
137             BNE     WR_ONE
138             INC     PPICPTR+1
139             BRA     WR_ONE
140 DONEWC1     JSR     NEWCOL          OTHERWISE, SETUP FOR NEW COLUMN
141             BNE     GETPPB          IF NOT FINISHED GET A NEW PACKED PIC BYTE
142             BRA     EXUP
143 WR_MANY     INY                     OK, NOW Y= 1 TO POINT TO PICTURE BYTE
144             LDA     [PPICPTR],Y     GET PIC BYTE
```

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LISTING 4: SP.PUP Source Code *(continued)*

```
145          STA    TEMP            SAVE IT
146          INY                    Y= 2 TO POINT TO BYTE COUNT
147          LDA    [PPICPTR],Y     GET BYTE COUNT
148          TAX                    PUT COUNT IN X
149          TYA    A               *PACKED PIC PTR UPDATE
150          ADC    PPICPTR         ADD 3 TO PACKED PIC PTR (CARRY IS SET)
151          STA    PPICPTR
152          BCC    RSTINDX
153          INC    PPICPTR+1
154 RSTINDX  LDY    #$00
155 RECALPB  LDA    TEMP            RECALL PIC BYTE
156          STA    [PICPTR],Y      WRITE PIC BYTE TO DISPLAY
157          DEC    VLIN
158          BEQ    DONEWCM         IF ON BOTTOM VLINE, DO NEW COL
159          CLC                    *UPDATE PICTURE POINTER
160          LDA    PICPTR
161          ADC    #$A0
162          STA    PICPTR
163          BCC    DECBC
164          INC    PICPTR+1
165 DECBC    DEX                    DEC BYTE COUNT
166          BNE    RECALPB         COUNT NOT ZERO? THEN CONTINUE
167          BRA    GETPPB          FINISHED, GET ANOTHER PACKED PIC BYTE
168 DONEWCM  JSR    NEWCOL          GO UPDATE PIC PTR FOR NEW COLUMN
169          BNE    DECBC           IF NOT FINISHED THEN CONTINUE
170 EXUP     JSR    XNATIVE
171          RTS
172          LONGA  OFF
173          LONGI  OFF
174 NEWCOL   PHP                    *UPDATE PIC PTR FOR NEW COL
175          REP    #$20            *SETS Z FLAG IF FINISHED
176          LONGA  ON
177          INC    PICSTRT
178          LDA    PICSTRT
179          STA    PICPTR
180          PLP
181          LONGA  OFF
182          LDA    VLINSV
183          STA    VLIN
184          INC    XS
185          LDA    XS
186          CMP    XE
187          RTS
188 *
189 *END OF CODE REQUIRED FOR UNPACK
190 *
191 INC_END  CLC                    *UPDATE PIC/DISP POINTER
192          LDA    PICPTR
193          ADC    #$A0
194          STA    PICPTR
195          BCC    NOC2
196          INC    PICPTR+1
197 NOC2     DEC    VLIN
198          BEQ    NEWCOL
199          RTS
200 WRINC    STA    [PPICPTR],Y     *WRITE TO PACKED PIC BLOCK AND
201          INC    PPICPTR         *INC PACKED PIC POINTER
202          BNE    NOC3
203          INC    PPICPTR+1
204 NOC3     RTS
205 PACK     JSR    PUPSTRT         *PICTURE PACKER
206          LDA    #$00            *FIND REPEAT PREFIX
207          TAY
208          TAX
209 FILL     STA    CNTPG,X
210          INX
211          BNE    FILL
212 LOOKPB   LDA    [PICPTR],Y
213          TAX
214          LDA    CNTPG,X
215          BMI    CNTUP
216          INC    CNTPG,X
217 CNTUP    JSR    INC_END
218          BNE    LOOKPB
219          LDX    #$00
220 CNTSCAN  LDA    CNTPG,X
221          BEQ    SVPFX
222          INX
223          BNE    CNTSCAN
224 DECALL   DEC    CNTPG,X
225          INX
226          BNE    DECALL
227          BRA    CNTSCAN
228 SVPFX    PHX
229          JSR    SETUP           REINITIALIZE
230          PLX
231          STX    PFX
232          LDY    #$05            *MAIN PACK ROUTINE
233 GETPFXB  LDA    DP+XS,Y         GET PIC PREFIX BYTE
234          STA    [PPBLKST],Y     WRITE BYTE TO PP BLOCK
235          DEY
236          BPL    GETPFXB
237          INY                    Y= 0
238 SAVEPTR  LDX    #$09            TEMP SAVE 10 PTR/CTR BYTES
239 GETPTRB  LDA    PICSTRT,X
240          STA    SVPTRS,X
241          DEX
242          BPL    GETPTRB
243          INX                    X= 0
244          LDA    [PICPTR],Y      GET A PIC BYTE
245          STA    TEMP
246          CMP    PFX             = REPEAT PREFIX?
247          BEQ    WRPFX           YES? THEN CODE AS REPEATED
248 INCPTRS  JSR    WRINC
249          JSR    INC_END
250          BEQ    EXIT0           END OF DISP? THEN EXIT
251          LDA    TEMP            RECALL PIC BYTE
252          CMP    [PICPTR],Y      A REPETITION?
253          BNE    SAVEPTR         NO? THEN DON'T CODE AS REPEATS
254          INX
255          CPX    #$03            HAVE ENOUGH REPEATS?
256          BNE    INCPTRS         NO? THEN CONTINUE
257          LDX    #$09            RESTORE 10 PTR/CTR BYTES
```

```
258 RECPTRB LDA     SVPTRS,X
259         STA     PICSTRT,X
260         DEX
261         BPL     RECPTRB
262         LDA     PFX
263 WRPFX   JSR     WRINC           TO ENCODE, 1ST WRITE REPEAT PFX
264         LDA     TEMP
265         JSR     WRINC           THEN WRITE THE BYTE TO REPEAT
266         LDX     #$ØØ            X= Ø TO BEGIN COUNT OF REPEATS
267 RECPB   LDA     TEMP            RECALL PIC BYTE YET AGAIN
268         CMP     [PICPTR],Y      SAME AS NEXT?
269         BNE     BCTOAØ          NO? THEN STOP COUNT
270         INX                     YES, SO INC COUNT
271         JSR     INC_END
272         BEQ     BCTOA1          END OF DISP? THEN STOP COUNT
273         CPX     #$FF            NEAR COUNTER OVERFLOW?
274         BNE     RECPB           NO? THEN LOOK AT NEXT BYTE
275 BCTOAØ  TXA     A               YES, SO STOP COUNT
276         JSR     WRINC           WRITE BYTE COUNT
277         BRA     SAVEPTR         CONTINUE
278 BCTOA1  TXA     A               EXIT1
279         JSR     WRINC           WRITE BYTE COUNT
280 EXITØ   PHP
281         REP     #$2Ø
282         LONGA   ON
283         SEC
284         LDA     PPICPTR
285         SBC     PPBLKST         CALC PACKED PIC LENGTH
286         LDY     #$Ø6            POINT TO PIC PREFIX BYTE 6
287         STA     [PPBLKST],Y     WRITE LENGTH
288         PLP
289         LONGA   OFF
290         LDA     PFBYTE
291         CMP     #$53
292         BNE     PKEXIT
293         REP     #$3Ø
294         LONGA   ON
295         LONGI   ON
296         LDX     #DISPSFX
297         LDA     PPICPTR
298         TAY
299         LDA     #$Ø2FF
300 PMVSUFX MVN     LPIC,LPPIC
301         SEP     #$3Ø
302 PKEXIT  JSR     XNATIVE
303         RTS
304         END
```

END OF LISTING 4

KEY PERFECT 5.Ø
RUN ON
SP.PUP

CODE-5.Ø	ADDR# - ADDR#	CODE-4.Ø
F84E48D7	9Ø1Ø - 9Ø5F	2451
77F579F5	9Ø6Ø - 9ØAF	28C2
89FFAD21	9ØBØ - 9ØFF	2D65
7115438C	91ØØ - 914F	2A86
78733F11	915Ø - 919F	26EE
4576C12B	91AØ - 91EF	266C
EØ8D6AD3	91FØ - 91F9	Ø46F
15B938A4	= PROGRAM TOTAL =	Ø1EA

LISTING 5: SP.PUP

```
9Ø1Ø- ØØ 2Ø E1 ØØ 1Ø ØØ ØØ ØØ
9Ø18- ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ
9Ø2Ø- ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ
9Ø28- ØØ ØØ ØØ ØØ ØØ ØØ ØØ ØØ
9Ø3Ø- ØØ ØØ C2 2Ø A9 ØØ ØØ 5B
9Ø38- E2 3Ø A9 ØØ 48 AB 38 FB
9Ø4Ø- 6Ø 18 FB E2 3Ø C2 2Ø A9
9Ø48- ØØ 9Ø 5B E2 3Ø A2 Ø5 B5
9Ø5Ø- 1Ø 95 1A BD Ø3 ØØ 95 21
9Ø58- CA 1Ø F4 18 A5 1D 69 1Ø
9Ø6Ø- 85 1D 9Ø Ø2 E6 1E C2 2Ø
9Ø68- A5 23 29 FF ØØ ØA 85 17
9Ø7Ø- ØA ØA 18 65 17 ØA ØA ØA
9Ø78- ØA 65 1Ø 85 17 A5 21 29
9Ø8Ø- FF ØØ 65 17 85 18 85 1A
9Ø88- E2 21 A5 24 E5 23 85 2Ø
9Ø9Ø- 85 16 6Ø 2Ø 41 9Ø A5 26
9Ø98- C9 53 DØ 15 C2 31 AØ Ø6
9ØAØ- ØØ B7 13 65 13 AA AØ ØØ
9ØA8- 9D A9 FF Ø2 54 E1 ØØ E2
9ØBØ- 3Ø AØ ØØ 8Ø 11 97 1A C6
9ØB8- 2Ø FØ 19 18 A5 1A 69 AØ
9ØCØ- 85 1A 9Ø Ø2 E6 1B B7 1D
9ØC8- C5 25 FØ ØF E6 1D DØ E5
9ØDØ- E6 1E 8Ø E1 2Ø 1Ø 91 DØ
9ØD8- ED 8Ø 31 C8 B7 1D 85 17
9ØEØ- C8 B7 1D AA 98 65 1D 85
9ØE8- 1D 9Ø Ø2 E6 1E AØ ØØ A5
9ØFØ- 17 97 1A C6 2Ø FØ 1Ø 18
9ØF8- A5 1A 69 AØ 85 1A 9Ø Ø2
91ØØ- E6 1B CA DØ EA 8Ø BF 2Ø
91Ø8- 1Ø 91 DØ F6 2Ø 32 9Ø 6Ø
911Ø- Ø8 C2 2Ø E6 18 A5 18 85
9118- 1A 28 A5 16 85 2Ø E6 21
912Ø- A5 21 C5 22 6Ø 18 A5 1A
9128- 69 AØ 85 1A 9Ø Ø2 E6 1B
913Ø- C6 2Ø FØ DC 6Ø 97 1D E6
9138- 1D DØ Ø2 E6 1E 6Ø 2Ø 41
914Ø- 9Ø A9 ØØ A8 AA 9D ØØ 2Ø
9148- E8 DØ FA B7 1A AA BD ØØ
915Ø- 2Ø 3Ø Ø3 FE ØØ 2Ø 2Ø 25
9158- 91 DØ FØ A2 ØØ BD ØØ 2Ø
916Ø- FØ ØB E8 DØ F8 DE ØØ 2Ø
9168- E8 DØ FA 8Ø FØ DA 2Ø 4D
917Ø- 9Ø FA 86 25 AØ Ø5 B9 21
9178- 9Ø 97 13 88 1Ø F8 C8 A2
918Ø- Ø9 B5 18 95 28 CA 1Ø F9
9188- E8 B7 1A 85 17 C5 25 FØ
919Ø- 1E 2Ø 35 91 2Ø 25 91 FØ
9198- 3A A5 17 D7 1A DØ EØ E8
91AØ- EØ Ø3 DØ ED A2 Ø9 B5 28
91A8- 95 18 CA 1Ø F9 A5 25 2Ø
91BØ- 35 91 A5 17 2Ø 35 91 A2
91B8- ØØ A5 17 D7 1A DØ ØA E8
91CØ- 2Ø 25 91 FØ ØA EØ FF DØ
91[illegible]- FØ 8A 2Ø 35 91 8Ø BØ 8A
91[illegible]- 2Ø 35 91 Ø8 C2 2Ø 38 A5
91[illegible]- 1D E5 13 AØ Ø6 97 13 28
91EØ- A5 26 C9 53 DØ 1Ø C2 3Ø
91E8- A2 ØØ 9D A5 1D A8 A9 FF
91FØ- Ø2 54 ØØ E1 E2 3Ø 2Ø 32
91F8- 9Ø 6Ø
```

END OF LISTING 5

LISTING 6: SP.DRD Source Code

```
 1 *         SP.DRD
 2 *         DIRECTORY READER FILE
 3 *         by Jeff Hurlburt
 4 *         Copyright 1988 by MicroSPARC, Inc.
 5 *         Concord MA  Ø1742
 6 *
 7 *         ORCA/M Assembler
 8 *
 9 *         DRDMV  DIRECTORY READER MOVER ($ØØ8EE7-$ØØ8EFF)
10 *                +
11 *         DRD    DIRECTORY READER ($ØØ8FØØ-$ØØ8F67)
12 *
13 *         DRDMV  MOVES DIRECTORY READER TO $Ø195ØØ.
14 *
15 *         KEEP    SP.DRD       (USE LINK TO MAKE SP.DRD.ROOT,SP.DRD)
16           ORG     $8EE7
17 SPDRD     START
18           ABSADDR ON
19           OBJ     $8EE7
20 PBLK1   EQU     $Ø1ØØØØ
21 ATL       EQU     $6B
22 ATH       EQU     $6C
23 BCADJ     EQU     $F9
24 DPL       EQU     $FA
25 DPH       EQU     $FB
26 ATPL      EQU     $FC
27 ATPH      EQU     $FD
28 FILECNT   EQU     $1Ø25
29           65816   ON
30           LONGA   ON
31           LONGI   ON
32 DRDMV     CLC
33           XCE
34           REP     #$3Ø
35           LDA     #$ØØ7F
36           LDX     #$8FØØ
37           LDY     #$95ØØ
38           MVN     Ø,PBLK1
39           SEP     #$3Ø
40           LONGA   OFF
41           LONGI   OFF
42           LDA     #$ØØ
43           PHA
44           PLB
45           SEC
46           XCE
47           RTS
48 *
49 *DRD EXECUTES IN EMMULATION MODE
50 *
51           OBJ     $95ØØ
52 DRD       LDA     #$Ø2           *BEGIN SETUP
53           STA     BCADJ
```

LISTING 6: SP.DRD Source Code *(continued)*

```
54          LDA   #$2B          *INIT DIRECTORY POINTER
55          STA   DPL
56          LDA   #$10
57          STA   DPH
58          CLC
59          LDA   ATL           *INIT ARRAY TABLE POINTER
60          ADC   #$07
61          STA   ATPL
62          LDA   #$00
63          ADC   ATH
64          STA   ATPH
65          LDX   FILECNT       X= NUMBER OF ENTRIES
66 NEXTBLK  LDY   #$00
67 NEXTENT  LDA   (DPL),Y       GET 1ST BYTE OF A DIRECTORY ENTRY
68          BNE   READENT       IF VALID THEN CONTINUE
69          JSR   INCDPTR       OTHERWISE POINT TO NEXT ENTRY
70          BRA   NEXTENT
71 READENT  AND   #$0F          ISOLATE ENTRY LENGTH
72          STA   (ATPL),Y      SAVE IT TO ARRAY TABLE
73          INY                 *MOVE STRING ADDR LO TO ARRAY TABLE
74          CLC
75          LDA   DPL
76          ADC   #$01
77          STA   (ATPL),Y
78          INY                 *MOVE STRING ADDR HI TO ARRAY TABLE
79          LDA   #$00
80          ADC   DPH
81          STA   (ATPL),Y
82          JSR   INCAPTR       *INC POINTERS
83          JSR   INCDPTR
84          DEX                 DEC ENTRIES COUNTER
85          BNE   NEXTBLK       IF NOT ZERO THEN CONTINUE
86          RTL
87 INCDPTR  CLC                 *INC DIRECTORY POINTER
88          LDA   DPL
89          ADC   #$27
90          STA   DPL
91          BCC   EXIDP
92          INC   DPH
93          DEC   BCADJ
94          BNE   EXIDP
95          LDA   #$02
96          STA   BCADJ
97          LDA   #$04          ADJUST DIR POINTER LO FOR LATER BLOCKS
98          STA   DPL
99 EXIDP    RTS
100 INCAPTR CLC                 *INC ARRAY TABLE POINTER
101         LDA   ATPL
102         ADC   #$03
103         STA   ATPL
104         BCC   EXISP
105         INC   ATPH
106 EXISP   RTS
107         END
```

END OF LISTING 6

```
             KEY PERFECT 5.0
                 RUN ON
                 SP.DRD
 ======================================
  CODE-5.0    ADDR# - ADDR#    CODE-4.0
  --------    -------------    --------
  B3D2F244    8EE7 - 8F36        2A72
  ED929505    8F37 - 8F67        1AA4
  4C76F2C6 = PROGRAM TOTAL =       81
```

LISTING 7: SP.DRD

```
8EE7- 18
8EE8- FB C2 30 A9 7F 00 A2 00
8EF0- 8F A0 00 95 54 01 00 E2
8EF8- 30 A9 00 48 AB 38 FB 60
8F00- A9 02 85 F9 A9 2B 85 FA
8F08- A9 10 85 FB 18 A5 6B 69
8F10- 07 85 FC A9 00 65 6C 85
8F18- FD AE 25 10 A0 00 B1 FA
8F20- D0 05 20 44 95 80 F7 29
8F28- 0F 91 FC C8 18 A5 FA 69
8F30- 01 91 FC C8 A9 00 65 FB
8F38- 91 FC 20 5C 95 20 44 95
8F40- CA D0 D9 6B 18 A5 FA 69
8F48- 27 85 FA 90 0E E6 FB C6
8F50- F9 D0 08 A9 02 85 F9 A9
8F58- 04 85 FA 60 18 A5 FC 69
8F60- 03 85 FC 90 02 E6 FD 60
```

END OF LISTING 7

LISTING 8: PACK.EXAMPLE

```
1  REM  ***********************
2  REM  *    PACK.EXAMPLE     *
3  REM  * BY Jeff Hurlburt    *
4  REM  * Copyright (C) 1988  *
5  REM  * BY MicroSPARC, Inc. *
6  REM  * Concord, MA   01742 *
7  REM  ***********************
10  PRINT  CHR$ (4)"BLOAD SP.PUP"
20 DISP = 49193:PACK = 37182:PL = 4102: FOR I
     = 0 TO 24: READ C: POKE 768 + I,C: NEXT
    I
30 P$ = "PICTURE": GOSUB 50: HOME : PRINT "Do
    ne."
40  END
50  POKE DISP,65: PRINT  CHR$ (4)"BLOAD"P$",T
    $C1,A$1000"
60  POKE 3,0: POKE 4,160: POKE 5,0: POKE 6,20
    0: POKE 8,83
70  CALL 768: POKE DISP,193: CALL PACK: PRINT
     CHR$ (7): POKE DISP,65: HOME : PRINT "S
    aving packed picture."
80  PRINT  CHR$ (4)"BSAVE"P$".PS,A$1000,L" PEEK
    (PL) + 256 *  PEEK (PL + 1) + 768: RETURN

90  DATA 24,251,194,48,169,255,127,162,0,16,1
    60,0,32,84,225,0,226,48,169,0,72,171,56,
    251,96
```

END OF LISTING 8

LISTING 9: UNPACK.EXAMPLE

```
1  REM   ***********************
2  REM   *   UNPACK.EXAMPLE    *
3  REM   * By Jeff Hurlburt    *
4  REM   * Copyright (C) 1988  *
5  REM   * BY MicroSPARC, Inc. *
6  REM   * Concord, MA   01742 *
7  REM   ***********************
10  PRINT  CHR$ (4)"BLOAD SP.PUP": HOME : PRINT
    "After viewing unpacked picture,": PRINT
    "press RETURN to quit."
20 DISP = 49193:UNPACK = 37011:PIC = 4096
30 P$ = "PICTURE.PS": GOSUB 50
40  END
50  POKE DISP,65: PRINT  CHR$ (4)"BLOAD"P$",A
    "PIC
60  FOR I = 0 TO 7: POKE 3 + I, PEEK (PIC + I
    ): NEXT I
70  POKE DISP,193: CALL UNPACK
80  PRINT  CHR$ (7): GET Q$: PRINT
90  POKE DISP,65: RETURN
```

END OF LISTING 9

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CIRCLE NUMBER 23

SCENE ON • THE

Edited by Mary Locke Albert

SOFTWARE

DOUBLE VISION is a ProDOS graphics utility that lets you create both double Hi-Res and double Lo-Res graphics using simple BASIC commands. The program adds 35 commands for plotting points, lines, shapes, and text in Double Hi-Res graphics, and supports scrolling, loading, and saving graphics. Two utilities for editing double Hi-Res shape tables and custom character sets are also included. Twenty-one character sets are provided. DOUBLE VISION also has an assembly language interface that lets you use all of its features with simple subroutine calls. The program runs on an enhanced 128K Apple IIe, IIc, or IIGS and costs $39.95. Contact: **Dynacomp, Inc., 1064 Gravel Road, Webster, NY 14580, (716) 671-6160.**

CIRCLE NUMBER 150

MULTISCRIBE 3.0's spelling checker uses an expandable 50,000-word dictionary that allows you to search, highlight, and correct one or more occurrences of misspellings in MultiScribe word processing documents. This version also includes a variety of special fonts, character sizes and styles, and on-line editing of individual characters. It offers six print modes, including two near-letter quality modes. The program's merge printing feature lets you print up to 16 documents as a single document. MULTISCRIBE 3.0 also includes user-definable page setup and search and replace functions. It runs on 128K Apple IIe or IIc and costs $79.95. Contact: **StyleWare, Inc., 5250 Gulfton, Suite 2E, Houston, TX 77081, (713) 668-1360.**

CIRCLE NUMBER 151

TO PRESERVE, PROTECT AND DEFEND is an educational game in which students play the role of a guard assigned to protect the Constitution the day before it is to be signed at the 1787 Constitutional Convention in Philadelphia. The program teaches about important figures of the Convention and some of the key issues that affected the original contents of the Constitution. Two databases are included: one with information on individuals and one containing synopses of the debates on 15 major subjects. The program's topics, number of activities, and difficulty level can be modified. It runs on Apple IIs with 128K and costs $55 for the 5.25-inch version and $59 for the 3.5-inch disk. Contact: **Minnesota Educational Computing Corporation, 3490 Lexington Ave. N., St. Paul, MN 55126, (612) 481-3527.**

CIRCLE NUMBER 152

GUILD OF THIEVES, the sequel to The Pawn, is an illustrated text adventure in which the object of the game is to become a member of the guild. This program also takes place in the mythical kingdom of Kerovnia, although the neighborhood seems to have deteriorated considerably since your first visit. The program has about 150 locations, including a castle, bank, zoo, and a maze of caves. It lets you interact with characters you meet and the parser understands sentences that contain up to 30 clauses. The package includes a humorous 40-page novella, a Bank of Kerovnia credit card, an Indenture and Contract of Service Certificate, dice, and play guide. The program costs $39.95. Contact: **Firebird Licensees, Inc., P.O. Box 49, Ramsey, NJ 07446, (201) 444-5700.**

CIRCLE NUMBER 175

APPLIED SCIENTIFIC SERIES programs are customizable AppleWorks templates. Accountant tracks personal cash, check, and credit card transactions. Accounts Payable is similar to Accountant, but designed for small businesses. Accounts Receivable records buyers, purchase order numbers, order and shipping dates, item, salesperson, and more. Payroll tracks information for hourly, daily, weekly, or monthly employees, while Financial Calculator calculates simple and compound interest, present value of a future payment, etc. Investment Portfolio summarizes stock, mutual fund, bond, and CD holdings. The packages cost $29.95 each and require AppleWorks and a 128K Apple IIe or IIc. Contact: **Applied Scientific, 416 Arnold, Bozeman, MT 59715, (406) 586-1157.**

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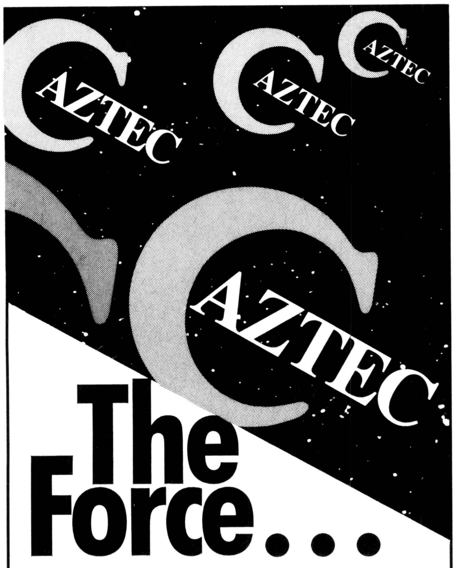
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Aztec C65-d runs under DOS 3.3 and produces applications that run under DOS 3.3 and the Aztec C Shell. **Aztec C65-d** includes a 6502 assembler, librarian. UNIX and non-UNIX libraries, linker, library source, and full screen editor.

Aztec C65-d (Apple DOS 3.3)...$199

C'Prime

C'Prime runs under DOS 3.3 and is a powerful subset of **C65-d.** C'Prime includes C compiler, 6502 Assembler, librarian, linker, UNIX and non-UNIX libraries, and development shell environment.

C'Prime (Apple DOS 3.3).......$75

Cross Development Systems

The **Aztec C65-c** Cross Development Systems are the most advanced development systems available for the Apple II. The PC/MS-DOS and Macintosh hosts include a full development system for the host machines as well as the complete set of compilers, assemblers, and other tools for the Apple II target. Both ProDOS and DOS 3.3 are targeted. The development tools for the host system, like **make** and **vi.** are also part of the cross environment. In some cases, code can be tested on the host. Download utilities are provided to transfer programs to the Apple II target. An impressive quantity of commercial software is implemented with this system.

Aztec C65-c Cross Compilers (PC/MS-Dos)..............$750

Apprentice C

Apprentice C is an incredibly inexpensive and easy to use "learn by doing" system. The system includes a text editor and direct to interpreted code C compiler that conforms to Kernighan & Ritchie. All the language features and UNIX libraries are supported except for bit fields. This system is great for learning C. It compiles fast, fast, fast.

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Portability

Programs developed with **Aztec C65** for ProDOS or DOS 3.3 are easily ported to other micros. **Manx Aztec C** is available for Macintosh, Amiga, PC/MS-DOS, ATARI ST. CP/M-80, CP/M-86, TRS-80, and others. **Manx Aztec C65** is compatible with standard C compilers available for a large variety of other machines.

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CIRCLE NUMBER 25

SCENE ON • THE

ACE REPORTER, SECOND EDITION adds an easy-to-use editor for creating new stories for the original program, which teaches reading skills. With room for 20 additional stories on side 2 of the disk, teachers can add, edit, delete, and save special stories for use in every reading program. The editor is designed so that children can also easily enter their own teletypes; interviews; who, what, when, where, or why facts; stories, and headlines. Once the stories are created, players are ready to uncover the facts before the paper goes to press. The program costs $49.99. Contact: **Mindplay, 82 Montvale Ave., Stoneham, MA 02180, (617) 438-5454.**

CIRCLE NUMBER 154

M-SS-NG L-NKS: SCIENCE DISK introduces students in grades 5-9 to 63 informative, scientific passages, each of them with some of the letters or words missing. Students must reconstruct the passages by filling in the blanks. Nine topics (Land Animals, Water Animals, Birds, Our Bodies, Air, Earth, Water, Planets, and the Solar System) are explored through their properties of temperature, light and dark, speed, size, weight, density, and age. The program costs $65 and provides nine puzzle formats that present a wide range of challenges. Contact: **Sunburst Communications, Inc., 39 Washington Ave., Pleasantville, NY 10570, (800) 431-1934.**

CIRCLE NUMBER 155

READING COMPREHENSION AND SPELLING SPEECHWARE combine speech and graphics to teach reading and spelling skills. READING COMPREHENSION ($174) uses narrative and expository selections to reinforce the concept of reading for meaning and understanding. Students may move at their own pace through the illustrated text. READING COMPREHENSION is for grade 1 and includes eight story disks. SPELLING SPEECHWARE uses computer-generated speech to give directions, pronounce the word to be spelled, and include the word in a sentence. Teachers may select a spelling list from a 9,000-word database. Designed for grade levels 1-6, SPELLING SPEECHWARE costs $72 per level. Both programs require an Apple II Plus, IIe or, IIGS with an Echo+ speech synthesizer or a IIc with a Cricket speech synthesizer. Contact: **Houghton Mifflin Co., Educational Software Division, P.O. Box 683, Hanover, NH 03755, (603) 448-3838.**

CIRCLE NUMBER 156

SCIENCE TOOLKIT MODULE 3: BODY LAB allows you to perform experiments in physiology, including ones on the circulatory, nervous, and respiratory systems. For use with the Science Toolkit Master Module, the program provides three on-screen instruments: a heart-rate meter, response timer, and a lung-volume meter. It also includes a spirometer, which measures the air entering and leaving the lungs. The Experiment Guide suggests a number of experiments that may be performed, including ones that study the effects of exercise on the heart and lungs, and how quickly the body responds to light, touch, or sound. The program costs $39.95. Contact: **Broderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903, (415) 492-3200.**

CIRCLE NUMBER 157

STAR RANK BOXING II adds new elements to Star Rank Boxing. The fluid animation and improved player control over the boxers lets your fighters block and duck punches and throw crosses, jabs, uppercuts and body shots. The program lets you box in two-player exhibition mode or compete against computer opponents and take a shot at the title. In exhibition mode, you may fight in any of three weight classes and create up to five fighters in each class. You design a training regimen for each boxer that includes running, sparring, and bag workouts. During the bouts, a knockout indicator uses color to show the relative strength and endurance levels of each boxer. The program costs $39.95. Contact: **Gamestar, 2350 Bayshore Pkwy., Mountain View, CA 94043, (415) 960-0410.**

CIRCLE NUMBER 158

AIDS: THE NEW EPIDEMIC AND AIDS: THE INVESTIGATION are two programs that examine the disease in different ways. In AIDS: THE NEW EPIDEMIC, a tutorial and a quiz cover facts on AIDS. Students complete lessons that explain symptoms, prevention, transmission, and testing for the disease. AIDS: THE INVESTIGATION allows the student to test, in game format, knowledge of how AIDS is spread. The player is presented with a situation in which a baby is born with AIDS. Armed with the information provided and an understanding of the virus, the student acts as a health investigator and attempts to unravel the events that led to the contraction of the disease. The programs are available for $54.95 each, or both for $94. Contact: **Marshware, P.O. Box 8082, Shawnee Mission, KS 66208, (800) 821-3303.**

CIRCLE NUMBER 159

SPEED READING helps students improve their reading skills and helps teachers monitor their progress. The Program disk contains a tutorial that introduces speed-reading techniques, while the Readings I disk contains passages on 20 topics and allows students to practice the technique. Comprehension questions after the first and last reading in a section determine the comprehension level and allow the teacher to monitor progress with the Management disk. SPEED READING costs $69.95. Contact: **Marshware, P.O. Box 8082, Shawnee Mission, KS 66208, (800) 821-3303.**

CIRCLE NUMBER 160

THE PRINT SHOP AND FANTAVISION have been upgraded to new versions. Completely redesigned, they take full advantage of the IIGS's improved graphics. The upgrade to THE PRINT SHOP can be used with existing Apple II versions of The Print Shop Companion and The Print Shop Graphics Library. The IIGS versions of the two programs are available only on 3.5-inch disks; the existing versions of these programs for other Apple IIs are still available. The IIGS versions of THE PRINT SHOP and FANTAVISION cost $59.95; owners of previous versions can obtain upgrades by sending their original Apple II program disks along with a check made out to Broderbund Software for $20 for each program. Schools may also return their program disks with $30 per program and receive a School Edition of each program, including a program disk, a backup disk, and a Teacher's guide. The new versions run only on the IIGS. Contact: **Broderbund Software, 17 Paul Drive, San Rafael, CA 94903; (415) 492-3200.**

CIRCLE NUMBER 161

IIGS

DESKWORKS is a collection of graphic Macintosh-like desk accessories including keyboard macros, an automatic phone dialer, and a calendar/appointment book. DESKWORK's programmable scientific calculator provides trigonometric functions, all arithmetic functions, and memory. Another accessory allows you to have a fixed on-screen clock while the machine is in use. Accessories also include a utility for automatically dimming the screen when the computer is not in use, a moveable on-screen clock, a scrapbook, a notebook, an alarm clock, and Enigma, an on-line code-breaking game. DESKWORKS runs on a 512K IIGS and is priced at $59.95. Contact: **StyleWare, Inc., 5250 Gulfton, Suite 2E, Houston, TX 77081, (713) 668-1360.**

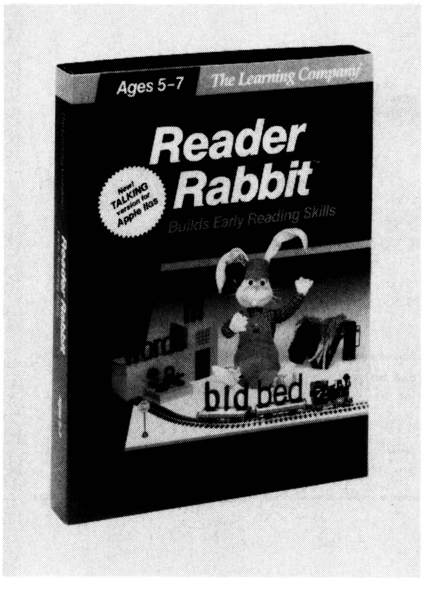
CIRCLE NUMBER 162

SHOWOFF lets you quickly create professional-looking visual aids and can also be used as an interactive teaching tool. Output includes overhead transparencies, 16-color printed sheets, and IIGS interactive video "slide shows." The program includes over 380 graphics, 140 borders, and a variety of type styles and sizes. In addition, a built-in graphics editor and design tools allow you to create original graphics. SHOWOFF costs $59.95. Contact: **Broderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903, (415) 492-3200.**

CIRCLE NUMBER 163

PAINT WRITE DRAW bundles the programs Paintworks Plus, Writer's Choice elite, Draw Plus, and Clip Art Gallery into one package for $229.95. The programs continue to be available separately. Paintworks Plus is a paint, graphics, and animation program while Writer's Choice elite is a full-color word processor with graphics integration. Draw Plus is an object-oriented precision drawing tool and Clip Art Gallery contains a collection of over 650 colorful images. PAINT WRITE DRAW requires a 512K Apple IIGS with a 3.5-inch drive. Contact: **Activision, Inc., 2350 Bayshore Pkwy., Mountain View, CA 94043, (415) 960-0410.**

CIRCLE NUMBER 164



READER RABBIT now uses digitized speech to talk to children while it teaches. The program uses four carefully-sequenced games to teach children ages 5-7 the basics of early reading, spelling, and vocabulary. Its extensive vocabulary contains more than 200 three-letter words. The program uses

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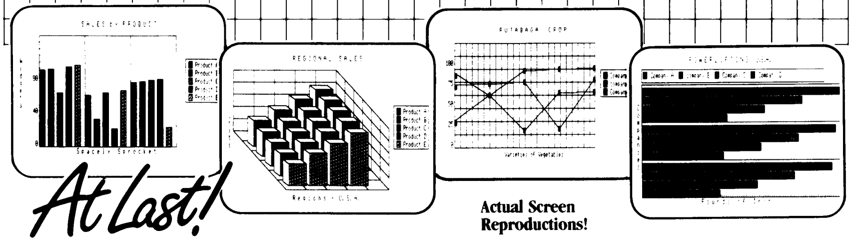
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a unique teaching approach to build thinking, problem-solving, and analytical skills at the same time. This version of READER RABBIT costs $59.95. Contact: **The Learning Company, 545 Middlefield Rd., Suite 170, Menlo Park, CA 94025, (415) 328-5410.**

CIRCLE NUMBER 165

THE PRINT SHOP GRAPHICS LIBRARY SAMPLER EDITION features a broad cross section of graphic elements to complement and enlarge the basic collection of The Print Shop's IIGS version. The various design elements take full advantage of the IIGS's resolution and color capabilities. The program costs $34.95 and includes over 180 graphics, borders, fonts, and colorful full-panel designs. Contact: **Broderbund Software, Inc., 17 Paul Dr., San Rafael, CA 94903, (415) 492-3200.**

CIRCLE NUMBER 166

LEGACY OF THE ANCIENTS is a fantasy adventure in which you are transported to the world of Tarmalon. There, you embark on a quest to retrieve the lost Wizard's Compendium, a leather scroll with evil powers. You begin at the Museum of Ancients and search through 12 towns, forests, castles, and dungeons. In addition to strategy and puzzle-solving aspects, the program requires managing character attributes. Five action games are incorporated in the adventure: three kinds of combat training and two fast-action options at the casino tables. LEGACY OF THE ANCIENTS is priced at $39.95. Contact: **Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404, (415) 571-7171.**

CIRCLE NUMBER 167

HARDWARE

RAMTALKER PLUS is a multifunction board for the Apple IIe, IIc, and IIGS. It contains a low-power battery-backed 256K RAM disk that uses static RAM and provides instant access from programs to high-quality speech. SmoothTalker speech is resident in a separate 32K RAM. An 8-bit digital to analog converter provides the output to a speaker driver allowing for both synthesized and digitized speech. An expansion port is built into the RAMTALKER PLUS, which also offers a clock-calendar that will automatically time stamp your files. RAMTALKER PLUS is $279 plus $3 shipping. Contact: **Electronic Learning Systems, 2630 N.W. 39th Ave., Gainesville, FL 32605, (904) 375-0558.**

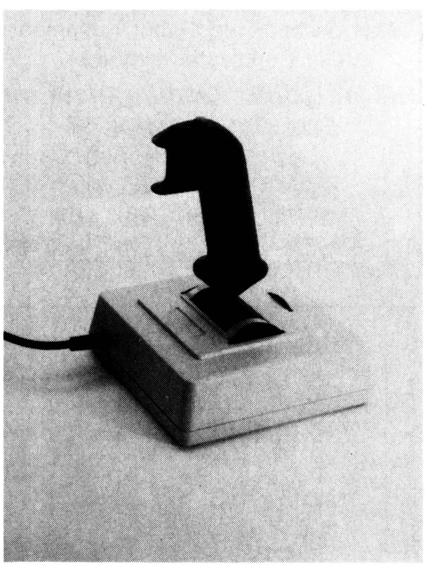
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DATA I/O 8 is a multipurpose analog and digital interface card for the Apple II Plus and IIe that allows you to make high-speed voltage measurements and generate custom voltage waveforms, as well as send and receive digital information. It features eight high-speed channels of both A/D and D/A, and 24 lines of both digital inputs and latched digital outputs. BASIC commands are used to read or write to the card. When connected to external sensors, the input section of the card will enable your computer to measure temperature, humidity, wind speed and direction, light intensity, and many other factors. The product is priced at $295 plus $5 shipping. Contact: **Naylor Industries, P.O. Box 33187, Indianapolis, IN 46203, (317) 783-6049.**

CIRCLE NUMBER 169

RESOURCES AND ACCESSORIES

FLIGHT STICK features a contoured pistol grip that fits in your hand. Its strategically-placed trigger and fire buttons provide both audio and tactile feedback that adds to the realism of flight simulations. FLIGHT STICK may also be used with any software designed for use with joysticks. It



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CIRCLE NUMBER 170

I-BUG (International Blind Users Group) allows blind and visually-impaired computer users from all over the world to communicate with each other. Its 24-hour bulletin board system, CompuHelp, contains data on self-help groups, software and hardware sources, other databases, Braille and taped manuals, voice output devices and large print programs, and more. Donations for individual memberships are $20 and for corporate memberships, $100. Members receive six issues of CompuHelp-On-Disk, a two-disk set that contains up-to-date data from the CompuHelp BBS along with a disk that users may return to I-BUG to reply to bulletins or mail. Contact: **National Association of Blind and Visually Impaired Computer Users, Inc., P.O. Box 1352, Roseville, CA 95661, (916) 783-0364.**

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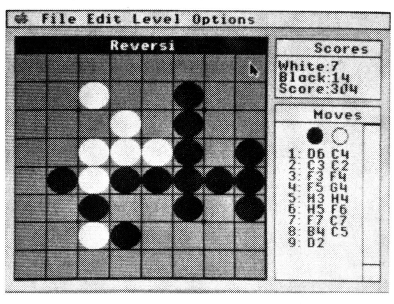
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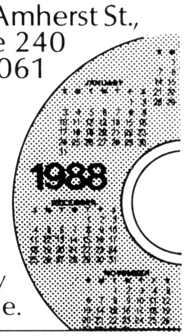
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Apple Info!

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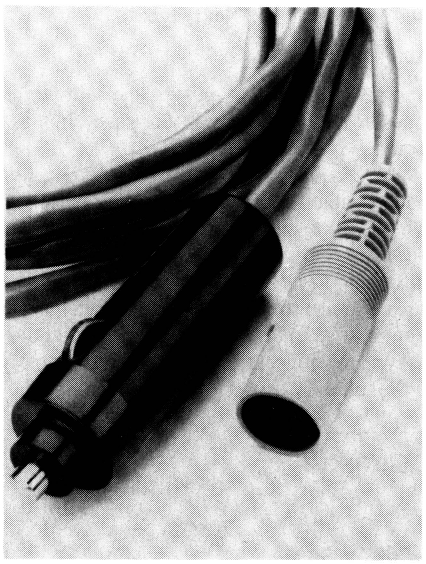
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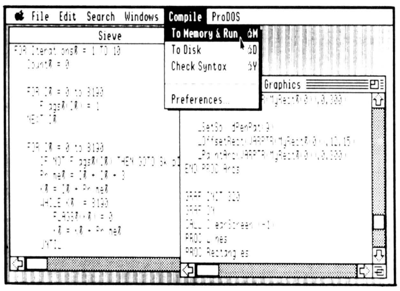
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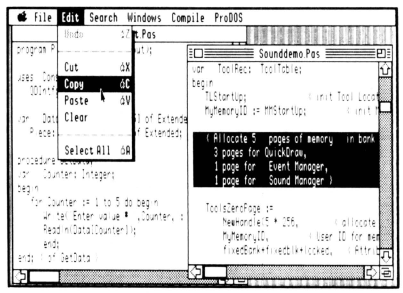
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CIRCLE NUMBER 36

TYPING TIPS

TYPING NIBBLE LISTINGS: IT'S AS EASY AS 1-2-3

You don't need to be a computer expert to type in *Nibble* listings. Just follow the simple directions on this page and watch your software library grow!

There are only three main steps to typing in a program:

1. Create a blank disk
2. Type in the listing.
3. Save it on the disk.

STEP 1: CREATING A BLANK DISK

If you are using ProDOS, simply use your System Utilities disk or the Filer program to format a disk. Filer will prompt you for each step of the process. When your disk is formatted, use the Copy option to copy the files PRODOS and BASIC.SYSTEM from the System Utilities or ProDOS master disk to your newly formatted disk. (Apple IIGS owners should copy the file P8 from the subdirectory/SYSTEM.DISK/SYSTEM and rename it as ProDOS.)

If you are using DOS 3.3, first boot your DOS 3.3 system master disk, then remove the disk from the drive and follow these steps:

1. Type NEW and press the Return key to clear the old program from memory.
2. Type 10 HOME and press Return.
3. Insert a blank disk in the drive, type INIT HELLO and press Return.

STEP 2: TYPING IN THE LISTING

Once you have a blank disk in the disk drive, turn the computer off and back on again. DOS 3.3 or ProDOS will be loaded and you're ready to type the program listing (or listings). The article accompanying each program contains specific directions for typing in and saving the program. It's a good idea to read through these directions before you begin, since they will list any special requirements. They will also tell you whether the program is written in Applesoft BASIC or machine language. This will determine the method you'll use to type it in.

Applesoft Programs

If the program is written in Applesoft BASIC, simply type NEW and press Return to clear memory. Then type in each line of the listing. Applesoft BASIC program lines always begin with a line number, and each line begins at the left margin of the published listing. (See **Listing 1** for an example of an Applesoft program.) Type all of the characters up to the next line number before pressing Return. Careful typing is a must, since a single incorrect character is enough to cause problems. It's a good idea to save your work on disk periodically as you type (see step 3).

LISTING 1

```
10 REM RING THE BELL
20 FOR J = 1 TO 5:PRINT CHR$(7)
   :NEXT J
30 END
```

When you have typed the listing(s) and saved it on disk, type RUN to try it out. If you have made a typing error, your program will probably halt and display an error message with a line number. Use the LIST command to display the line and check it against the published listing. For example, to display **line 30**, you would type LIST 30 and press Return. The easiest way to correct the line is simply to retype it.

To display a sequence of lines, type LIST and the line number range in which you are interested. For example, to list lines 30 through 150, type LIST 30,150. If you first activate your printer with a PR#1 command (if your printer is in slot 1), the listing will be sent to the printer.

Machine Language Programs

To type in machine language programs, you will use a special part of your Apple called the Monitor (not to be confused with your video display). To do so, simply type CALL −151 and press Return (this is often referred to as "getting into the Monitor"). You'll know that you've succeeded because the prompt character will change from the Applesoft prompt (]) to an asterisk (*).

Machine language listings are published in two different formats, as shown in **Listings 2 and 3**. Both listings result in the same program, and in both cases, you are looking at "addresses" in memory (RAM) and the byte values that are stored at those addresses. (The numbers may look unfamiliar because they are in hexadecimal, base 16, notation. The dollar sign ($) is often used to indicate that a value is in hexadecimal notion.) For example, in **Listings 2 and 3**, the number 0300 is the address in memory and A2 is the value stored at that location. Likewise, the value 05 is stored at address 0301. Note that leading zeros may be omitted if desired (e.g., 301 is the same as 0301).

To type in a listing such as that shown in **Listing 2**, first type:

```
300:A2 5 20 DD FB CA F0 3
```

and press Return. Then type the following lines in just the same way.

LISTING 2

```
0300- A2 05 20 DD FB CA F0 03
0308- 4C 02 03 60
```

To type in a listing such as that shown in **Listing 3**, first type:

```
300:A2 5
```

and press Return. Next, type:

```
302:20 DD FB
```

and press Return. Then type the following lines in the same way. Again, save often as you type (see step 3).

To check your typing, first type the address you want to check and press Return. This will display the byte value at that address. Press Return again to display the next seven bytes. You may then continue to press Return to display eight byte values at a time. The easiest way to change a byte is to type the address, a colon and the correct byte value.

LISTING 3

```
                   1 *RINGER PROGRAM
                   2       ORG $300
                   3 BELL  EQU $FBDD
0300: A2 05        4       LDX #$5
0302: 20 DD FB     5 LOOP  JSR BELL
0305: CA           6       DEX
0306: F0 03        7       BEQ END
0308: 4C 02 03     8       JMP LOOP
030B: 60           9 END   RTS
```

To display a range of addresses, type the beginning and ending addresses separated by a period and press Return. For example, to display the contents of memory from $300 to $3A0, type:

```
300.3A0
```

Again, activating your printer with a PR#1 command causes this information to be sent to your printer.

STEP 3: SAVING THE PROGRAM ON DISK

Saving a program on disk is simply a matter of giving the correct command. To find the correct command for saving a program, check the section of the article on entering the program.

If the program is written in Applesoft BASIC, the command to save it will look like this:

SAVE ***filename***

where *filename* is the name of the program. For example, to save the sample program in **Listing 1** under the name BELLS, type:

SAVE BELLS

If the program is written in machine language, the command to save it will look like this:

BSAVE ***filename*,A$*address*,L$*length***

where *filename* is the name of the program, *address* is the starting memory address, and *length* is the length or number of bytes that will be saved. For example, to save the sample program in **Listings 2 or 3**, type:

BSAVE RINGER,A$300,L$C

That's all there is to it!

HERE'S MORE HELP

Nibble has a unique support system to make sure you are able to type in your programs correctly. First, each article contains complete directions for entering and saving the programs. Second, all long programs are accompanied by a Key Perfect table that can be used to detect typing errors (for details, see below). Third, the Nibble Hot Line is available 24 hours a day to report errata and offer tips. Finally, we offer technical assistance by mail or phone. Here are some answers to the questions we are most often asked and some tips that will make typing *Nibble* programs even easier.

Saving Partial Programs

It is a good idea to save your program every few minutes as you type it in. This is good protection against losing lots of data because of power losses or human error. Just follow the directions on saving the program given in the article.

Error Traps

Some programs have error traps that perform a necessary function in the program. Unfortunately, these traps will also catch typing errors. Until you're sure you have typed the program correctly, you may want to replace lines that contain the statement ONERR GOTO *nn* (*nn* stands for a line number) with simple REM statements.

Spaces and PRINT Statements

To save some time typing in Applesoft listings, you can omit any spacing that does not appear between quotation marks. Also, you can replace any PRINT command with a question mark (?). Your Apple will automatically add the spaces and replace the question mark with a PRINT when you LIST the program. It is especially important to follow these instructions typing in the one-liner and two-liner winners (see Typing Tips in the One-Liner and Two-Liner Winners section).

Keyboard Buffering

Many Applesoft programs will not work on the IIGS if keyboard buffering is enabled. Be sure to use the control panel to turn keyboard buffering off before running Applesoft programs.

DATA Statements

Be particularly careful when typing Applesoft program lines that contain the word DATA. Typos in other lines will probably show up as syntax errors when the program is run, but those in DATA statements may not.

Program Modifications

Don't try to make your own modifications to the program until you have typed it in as published and have run it successfully.

Reading Aloud

One good way to check your typing is to have a friend read the published listing to you while you check your typed version against it. Alternatively, you can tape-record the reading and play it back as you check your typing.

Program Editors

Program editors are like word processors for programs. They are designed to allow easy entry and editing of program code. GALE, an Applesoft program editor, and MLE, a machine language editor, are available from MicroSPARC, Inc., 52 Domino Dr., Concord, MA 01742, (617) 371-1660. GALE is $49.95 and MLE is $29.95. *See below for shipping rates.

Key Perfect

Key Perfect is a program that will check your typing by reading in the file you have saved on disk. It will print a list of line numbers (for Applesoft programs) or addresses (for machine language programs) and corresponding check codes. You simply match the check codes printed in the magazine against those generated on your file. If the two don't match, there is a typing error. (If you have typed only part of the program or have omitted ONERR statements, the codes will not match.) Key Perfect is available for $29.95 from MicroSPARC. Phone orders are accepted with VISA or MasterCard. *See below for shipping rates.

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If you have a 300 or 1200 baud modem, you can call the Nibble Hot Line at (617) 369-8920 to receive the latest errata notices, download a one-liner, or order a *Nibble*/MicroSPARC product. Set your communications software at 8 data bits, 1 stop bit, no parity, full duplex. The Hot Line will automatically determine the correct baud rate.

Technical Support

If you run into a problem you can't solve, send your questions and an SASE to the *Nibble* Technical Support Department at 52 Domino Dr., Concord, MA 01742. Phone support is available on the Tech Support line from Monday through Friday between 2 and 5 EST at (617) 371-1669.

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HOME FINANCE MANAGER

Find out exactly where your money goes, with the Home Finance Manager.

■ **TRAC** (Trend Reporting, Analysis and Control) monitors your credit card, check and cash expenditures. It prints more than 10 different useful reports for analyzing your spending and managing your budget. Discover just where your money slips away — and start saving!
■ **TRAC Budget** is a flexible, fast budget preparation and reporting system. It allows you to easily prepare a personal budget, then prints reports that compare your budget to actual expenditures on an ongoing basis.
■ **TRAC Income** adds a third major module to the system. It generates monthly income statements and year-to-date reports.
■ **TRAC Graph** plots your personal finances in Hi-Res graphics for quick, visual analysis.

~~$29.95~~
Order No. **F03** Home Finance Manager **$17.95**

MONEY SAVERS

■ **Nibble Banker** records and codes checking transactions, helps balance your checkbook and prints out expense reports for the categories you specify.
■ **Nibble Decisionmaker** evaluates alternative buying decisions down to the penny. So you spend your money more wisely.
■ **Loan Payback** instantly calculates the monthly payments on a loan for various principal amounts and interest rates. Requires IIc or IIe with auxiliary 80-column card.

~~$29.95~~
Order No. **F06** Money Savers **$17.95**

SMALL BUSINESS TOOLS

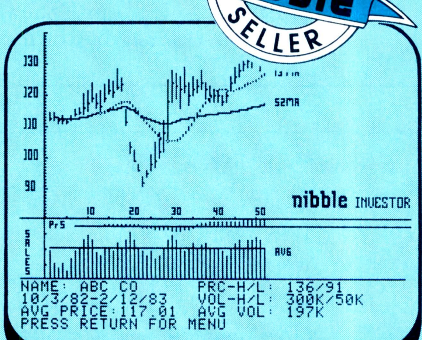
■ **The Forms Shop** creates customized letterhead, business forms and stationery in a variety of typestyles. (Requires a printer.)
■ **AppleWorks Plot** adds a Hi-Res plotter to AppleWorks. Print out a graph of spreadsheet or database data, or save it to disk.
■ **AppleWorks Bar Charts** lets you create bar charts from AppleWorks data.
■ **Quick Calendar** prints a full year's calendar on one page.

~~$24.95~~
Order No. **F07** Small Business Tools . . . **$16.95**

PERSONAL INVESTOR

BEST nibble SELLER

Ride the bulls and bears to investment success!



■ **The Investor** is a best-seller with five different reports including market, sales and yield analyses. Powerful Hi-Res graphs depict short-term and long-term price and market trends for each stock. Invaluable for deciding on sells/buys or for assembling information for tax reporting.
■ **Price File Editor** makes your investment analysis even more efficient. Records can be sorted, deleted and quickly added to the Investor's price files.

Order No. **F01** Personal Investor **$29.95**



Around The House

SHOPPER

Keep your life running smoothly with these super household organizers.

■ **Super Shopper** maintains a master list of up to 1,600 separate items and lets you print out custom shopping lists for each trip to the grocer. Organize items into categories by product type or according to the aisles in your favorite store. You can easily create new lists and alphabetize the grocery items within categories with the touch of a key. (Requires a printer.)

■ **Coupman** keeps track of money-saving grocery coupons, so you maximize your household budget. Coupman lets you organize your coupons, weed out expired ones, and search by product name or category. Easy search and sort options let you select the coupons you want to take to the supermarket.

■ **Recipe Box** lets you keep your favorite recipes on disk where you can quickly and easily retrieve, edit, display and print out copies for a friend. Planning a party or dining alone? Use Recipe Box to automatically determine the ingredient quantities needed for any number of guests. You can even include margin notes to remind yourself whether the recipe was a hit. Your Apple can't do the cooking for you, but this program can surely save you time in the kitchen.

~~$29.95~~
Order No. **H01** Shopper **$19.95**

HOMEMAKER

■ **Medic** lets you track your medical expenses while maintaining a record of your family's medical history, including innoculations, illnesses, treatments and medications. Print out a list of prescription medicines for any family member to take to the doctor's office — or to use in tabulating medical costs when itemizing tax deductions. Medic's easy entry, editing and reporting features will help keep you (and your budget) feeling better. (Requires a printer.)

■ **Electronic Message Center** offers the features of a message center system at a fraction of the cost. It's a versatile message handler for entering, editing and automatically displaying sequences of eye-catching messages. A fun way to "pass the word" at home or in the office.

■ **Meterman** lets you keep track of your family's utility usage and payments, then review the data in tabular or graphic format for cost analysis. An easy way to help you save money. (Requires an 80-column card; not compatible with the Apple II Plus.)

■ **Expense Calc** gives you a quick and accurate picture of your business travel expenditures. This easy-to-use expense report management system neatly formats weekly expense calculations, and provides printed reports in 80 columns. Although the program was designed to track business expenses, it can be easily adapted for personal expenditures.

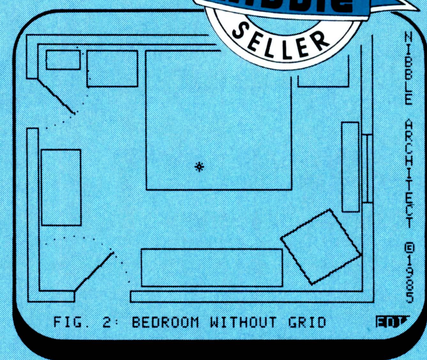
~~$29.95~~
Order No. **H03** Homemaker **$14.95**

HOME ARCHITECT

Design your dream house!

■ **Nibble Architect** uses the principles behind professional computer-aided design systems, to let you develop floor plans with ease and flexibility. Create, modify, and manipulate up to 50 items per room (including doors and windows) while maintaining accuracy to the nearest inch. Objects can be drawn to scale, and then moved, changed and duplicated — all in Hi-Res graphics that help you easily visualize different layouts. After planning your room design, print the layout and save it on disk for future reference when you get in the mood to rearrange the room again!

■ **The Shape** takes advantage of the Apple's powerful graphics capability it allows you to create, view, edit and save shape tables. Free-form shapes created in Lo-Res graphics are automatically translated into Hi-Res shape tables. Since the shapes are in a standard format, they can be used in any Applesoft or assembly language program. Have fun jazzing up your own programs with graphics that you design. Requires Apple II Plus and IIe only.



BEST nibble SELLER

Order No. **H07** Home Architect **$29.95**

CAR AND TRAVEL PACK

Have Apple, will travel. You'll get amazing mileage out of the Car and Travel Pack.

■ **Gas Miser** is a thrifty program that tracks gas consumption. You can chart your gas mileage during selected time intervals or for an entire year, then plot the results in Hi-Res graphics. All data can be saved and used later for comparisons. Even better, Gas Miser is so flexible, it can be easily modified to measure your use of electricity, food or any other household expense. (Requires a printer.)

■ **Apple Highways** finds the best route for your next road trip and figures out the distance you'll travel. Apple Highways can plan your route, list intermediate cities and highway numbers, and then automatically calculate the mileage for each leg of the journey. You can add to the 170 major US cities already included on the disk. Once your planning is complete, you can print both the route and the mileage between junctions. Get ready to go!

■ **Nibble Garage** makes preventive maintenance a snap! It simplifies your record keeping for one or several cars. You just need your owner's manual, and some idea of the date and odometer reading at the time each item was last serviced. Then relax and let Nibble Garage generate the repair reminders that keep your car running smoothly.

■ **Expense Calc** gives you a quick and accurate picture of your business travel expenditures. This easy-to-use spreadsheet program neatly formats weekly expense calculations, and provides printed reports in 80 columns. Although the program was designed to track business expenses, it can be easily adapted for personal expenditures.

~~$29.95~~
Order No. **H06** Car and Travel Pack . **$19.95**

Around The House

(continued)

CALENDAR LIBRARY

Throw out that scribbled desk calendar and those ink-smudged memos.

■ **Nibble Desk Calendar** is a quick-reference desk calendar that lets you highlight dates and print out a list of the corresponding events. Menu bar selection makes entering, changing or deleting events a snap!

■ **Personal Appointment Calendar** keeps track of a year's worth of appointments with fast editing and printing.

■ **Quick Calendar** prints a full year's calendar on a single page. You'll never need to buy a calendar again!

~~$24.95~~

Order No. **H08** Calendar Library **$13.95**

MAIL MANAGER

Take aim at labels and lists.

■ **AIM (Automated Intelligent Mailing)** manages your mailings with ease. Because AIM lets you define up to 32 fields of information in each record, you can customize your lists to include exactly the information you need. After defining the format, you can display the data, make any changes, delete, find, sort, and print the labels. An "assembling" feature even lets you select the fields you want to print out on the label.

■ **Postmaster** lets you create records for up to 100 labels, save them on disk, then print them out in a variety of styles. A second program lets you customize the printer options to take advantage of the type style capabilities of your own printer. In addition to maintaining and printing mailing lists, Postmaster is especially handy for any situation where you want to file and print a variety of freely formatted labels. Printing mailing labels has never been easier! (Requires a printer.)

~~$24.95~~

Order No. **H05** Mail Manager **$16.95**

BEST nibble SELLER

DATABASE LIBRARY

Filing was never easier!

■ **Executive Card File** gives you the flexibility of an index card file, with the electronic advantages of easy data entry and editing, speedy sorting and disk-based storage. The primary advantage of an index card system is its flexibility: data can be entered and organized in virtually any manner. Each "card file" may contain up to seven sections, delineated by dividers. Within each section, as many as 35 index cards can be stored, and each card can hold nearly 500 characters. Once filed, index cards can be displayed, edited, sorted, removed or printed to a printer.

■ **Nibble File Cabinet** can be used to keep track of household or business information such as names and addresses, home inventory and everything else you might otherwise store on index cards. Unlike its paper counterpart, however, information stored in your File Cabinet can easily be modified, rearranged or displayed according to your needs. Nibble File Cabinet enables fast, easy record keeping and includes such features as variable length records with key sorts and binary tree data storage. A Nibble best-seller.

■ **Applesoft Record Command System (ARC)** is a comprehensive information storage and management program. Features include advanced data filing, editing, printing and telephone dialing. Build your own records and fields, search records, merge files and send data to your printer. And since your entire data set is stored in memory, ARC is *fast*.

~~$29.95~~

Order No. **H10** Database Library . . . **$24.95**

HOME HELPERS

■ **Nibble Reminder** tracks the items you loan to friends and the dates you expect them back. With modifications, you can turn it into a garden planner, freezer monitor, mail order minder or chore planner.

■ **Quick Calendar** prints a full year's calendar on one page. You'll never need to buy a calendar again!

■ **Instant Area Codes** provides the area codes for all the states and selected cities, so you don't have to call the operator.

~~$24.95~~

Order No. **H11** Home Helpers **$14.95**

BEST nibble SELLER

DIETER

An Apple a day keeps calories away!

■ **Diner** is a personal diet planner that not only provides you with a nutritional analysis of foods and entire recipes, but also helps you keep track of your eating habits. The disk includes a database of over 400 foods, showing vitamin, mineral, protein, cholesterol, fat and calorie content. Now you can customize your menu planning to match your body type, and develop both long-term and short-term diet planning. Users have told us that Diner outperforms other similar programs costing many times its price.

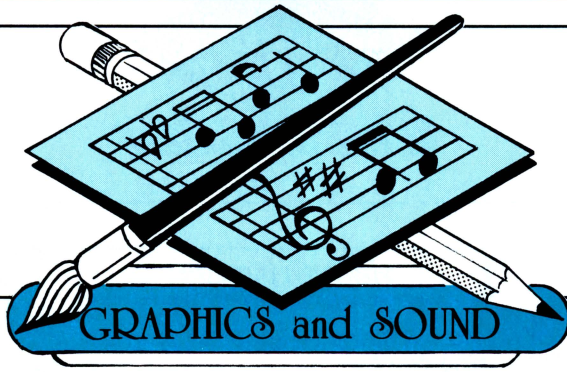
■ **Calorie Counter** tallies your calorie consumption so you can reach your daily goals. Enter the calorie contents of the foods you eat, and they're alphabetized and stored on disk for future reference. You assign calorie data to breakfast, lunch, dinner or snack categories. An automatic warning is flashed when you go over your daily limit!

■ **Fat Graph** tracks your dieting progress by plotting weight changes in glowing Hi-Res color. Just enter your weight every day; Fat Graph will plot it over time (for up to 120 days), and display your progress. Get together with your pals and shed those unwanted pounds.

■ **Recipe Box** makes cookbooking simple. It keeps your favorite recipes on disk where you can quickly and easily retrieve, edit, display and print out copies for a friend. Planning a party or dining alone? Use Recipe Box to automatically determine the ingredient quantities needed for any number of guests. You can even include margin notes to remind yourself whether the recipe was a hit — or a bomb!

~~$29.95~~

Order No. **H02** Dieter **$24.95**



SOUND MAKER

Your Apple won't hit a sour note, with this melodic quartet on call.

■ **Sound Synthesizer** creates sounds ranging from a complete musical score to explosions, machine guns and even bird calls. This sound creation utility lets you "draw" your sound effects on the screen in Hi-Res graphics. All sound effects can be saved on disk and replayed with a single command or stored in libraries for later use in your own Applesoft or machine language programs.
■ **Nibble Duet** jazzes up your programs with synthesized two-voice sounds. Create sophisticated sound effects to complement your visual effects. A machine language driver generates the notes, and a demonstration program shows you how to vary them and add sounds to your programs.
■ **Apple Talker** turns your Apple into a digital recorder. Sounds and words prerecorded on tape are introduced into the Apple via the cassette input, sampled and stored in memory. Once in memory, the sounds may be transferred to disk, combined with other sounds and replayed. With Apple Talker you can be innovative and add speech to your programs without purchasing any expensive hardware. (Not compatible with the IIc.)
■ **Beep Customizer** lets you modify your Apple's beep and includes the changes in other DOS 3.3 programs.

~~$24.95~~
Order No. **S02** Sound Maker **$16.95**

MUSIC MAKER

The screens are alive with the sound of music!

If you've tried incorporating music into your programs, spent hours fiddling with POKEs and CALLs, and still haven't gotten the musical notes you want, then try Music Maker — before you break your baton.
■ **Tunes** is an easy-to-use music system designed for quickly entering any tune into your Applesoft program. Play any note in a four octave range, with a duration as short as a quick click or as long as six continuous minutes! With a little extra effort, you can create songs and snazzy sound effects. Sharps, flats, duration, staccato, pauses, and all of the other piano/organ effects are there at your fingertips.
■ **Nibble Maestro** transforms your Apple keyboard into a four-octave organ. As you touch the keys, your Apple plays the corresponding notes and they simultaneously appear in the staff on the screen. Songs may be stored onto and replayed from disk. If you don't complete a song in one session, you can save it on disk and finish later. Or you can save a song and edit it later. Use all 49 notes to compose tunes with Nibble Maestro.
■ **Little Organ Apple** is a Hi-Res representation of a two-octave organ keyboard that you can really play! This instrument can be used by anyone for recreation, by composers and other musicians for experimentation, and by students for practice.
■ **Happy Birthday** plays the "Happy Birthday" song and displays the words complete with the birthday person's name. Perfect for your youngster's next birthday.
■ **Guitar Chord Tutor** draws the first six frets of a guitar, and then uses Lo-Res graphics to overlay the proper finger placement. All basic major, minor and seventh chords are available. There's even a special feature that lets you test yourself on what you've learned, so that you can measure your progress.

~~$24.95~~
Order No. **S01** Music Maker **$16.95**

GRAPHICS PROGRAMMER

Make your programs strut like peacocks, with the Hi-Res razzle-dazzle you'll find on the Graphics Programmer disk.

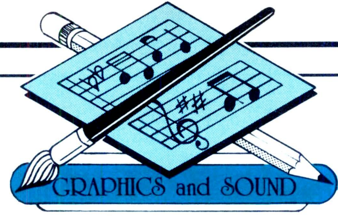
■ **Hi-Res Houdini** performs Hi-Res magic on your Applesoft or assembly language programs. Use machine language utility to create special graphic effects: scrolling and shifting images, changing shape colors, inverting Hi-Res colors, and merging, copying and swapping pictures on both screens. The graphics are amazing, and it's magically easy to use.
■ **Hi-Res Fill-Reverse** adds pizzazz to your Hi-Res graphic displays. Specify any rectangle and fill it with the color you select. Then use Reverse to create an explosion or produce other spectacular effects.
■ **Graphics Toolbox** is all you need to create dynamic animations. You'll have fun watching the effects produced by switching Hi-Res pages, inverting the images, and superimposing the page 2 image on page 1. This collection of graphics utilities incorporates a new technique that lets you store machine language programs in front of Applesoft programs so that when they run together, they act as one big machine language program. A super tool for creating special effects.
■ **Amper DHR** taps your Apple's double Hi-Res capabilities so you can produce sharper, more realistic graphics. This library of ampersand routines lets you use special commands in your Applesoft programs to simulate normal Hi-Res commands. You get twice the normal horizontal graphics resolution on your Apple. (Requires at least 128K of RAM; not compatible with the Apple II Plus.)
■ **Eye Openers** makes a dramatic transition from one Hi-Res picture to another with an opening iris effect. An ever-widening hole appears in the center of the old image, revealing the new image. Use this machine language routine to make that professional-looking transition between images in your own Applesoft graphics shows!

~~$24.95~~
Order No. **A05** Graphics Programmer **$14.95**

PRESENTATION LIBRARY

The Presentation Library gets your message across graphically!

■ **Chart Manager** transforms numeric data into sophisticated graphics. This versatile program performs basic statistical analyses, sorts and edits data, produces linear regressions, and then transforms the data into Hi-Res scatter plots, pie charts and bar graphs. Perfect for sales analyses and forecasting, personal finance evaluations and graphing, investment analysis, and other applications that require graphic output. Data can be keyed in or read from disk. Chart Manager is easy to use and provides many error checks to ensure efficient operation.
■ **Banner Boss** creates custom, eye-catching banners for parties, promotions — or any special occasion. Messages can be up to 255 characters long, written in letters two or five inches high, with underlining and emphasized print to add a personal touch. Say it with banners! (Requires a printer.)
■ **Color Billboard** turns your Apple into a dynamic electronic billboard for displaying attention-getting messages in 15 different colors. Features include smooth, fast text scrolling and colored blinking lights. The built-in editor lets you create your message, and then immediately view it on Color Billboard. Great for leaving messages for the family at home, to use as math or language flashcards in school,



(continued)

or for advertising those special sale items at your store.

■ **Solid State Slide Show** stores Hi-Res pictures and displays them with the speed of a slide show. This machine language utility manages memory swapping to let you store up to 18 different pictures to be used in your presentation. Use it for games or as an attention-getter in a store or trade show. (Requires at least 64K of RAM.)

~~$29.95~~

Order No. **A04** Presentation Library . . . **$19.95**

DESIGNER/ILLUSTRATOR

■ **Designer and Illustrator** let you create complex graphics for gardening/landscaping, title displays, games development, or circuit/pipe layouts the easy way! Use the Illustrator to create graphics shapes; use the Designer to combine the shapes in your graphics library to build complex, professional displays. Together they let you scale, color, edit, rotate and even redraw your shapes in "medium resolution" graphics. Then catalog, retrieve and control them to make your own designs. Make things look the way you want them to look — and have fun doing it too!

■ **The Shape** takes advantage of the Apple's powerful graphics capability. It allows you to create, view, edit and save shape tables. The free-form shapes created in Lo-Res graphics are automatically translated into Hi-Res shape tables. Since the shapes are in a standard format, they can be used in any Applesoft or assembly language program. Have fun jazzing up your own programs with graphics that you design.

~~$29.95~~

Order No. **A02** Designer/Illustrator . . . **$19.95**

TURTLE LIBRARY

Find out how easy graphics programming can be!

This LOGO-like package teaches programming concepts while you create fun graphic designs.

■ **Turtle BASIC** adds turtle graphics commands to Applesoft. You use 24 special keywords to direct the "turtle" around the screen, print Hi-Res text, create animation and more. Turtle BASIC is fast. But watch out! Once your children start programming with the turtle, they may leave you in the dust.

■ **Apple Turtle Graphics** lets you use simple commands to move and turn the turtle, as it draws pictures on the screen. Turtle Graphics is an excellent tool for learning simple programming concepts, conceptualizing math concepts and geometry, or just creating nifty pictures.

■ **Turtle Tutor** is a demonstration library that shows you how to design your own pictures, combine them . . . even create 3-D effects.

~~$29.95~~

Order No. **A01** Turtle Library **$19.95**

FONT FOUNDRY

■ **The Font Foundry** is a character generator and editor that you can use to design one-of-a-kind Hi-Res character sets. Make your documents print shop perfect!

■ **Double Hi-Res Characters** prints legends and captions in a variety of special character sets, including DOS Tool Kit format characters.

■ **Print Shop Utility** lets you capture an area from the Hi-Res screen and import it into Print Shop.

■ **Font Blaster** makes your Apple print like a Mac. It lets you use dozens of Tool Kit typefaces or create custom characters for the ImageWriter and Prowriter.

~~$29.95~~

Order No. **A08** Font Foundry **$19.95**

ARTIST

Draw on your full creative talents.

■ **Apple Paint Box** is an electronic coloring book that combines the features of an Etch-A-Sketch, Spiral-Graph and a function-driven drawing board. Once you've drawn your shape, you can fill it with a flood of color.

■ **PAGE** (Programmer's Aid for Graphics Entry) lets you draw Hi-Res graphics, and then save them to disk as screen images or as program lines to include with your favorite Applesoft program. It also features a Help screen and options to draw, erase and change colors. At last! An alternative to shape tables.

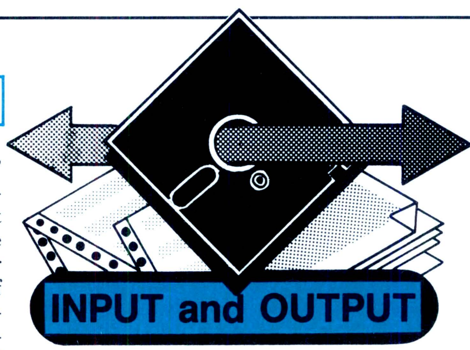
■ **Art Gallery** is a Hi-Res video show of 33 different art forms, some accompanied by sound. Each art form has multiple variations and provides hours of entertainment. Just sit back and enjoy it.

■ **Hi-Res Shapemaker** is an easy-to-use program that enables you to draw boxes, lines or shapes, fill them in, and then frame the pictures. When it's finished, your masterpiece can be saved on disk.

■ **DHR Palette** lets you design double Hi-Res graphics in black-and-white or color, and save the entire screen to disk for future fun. (Requires at least 128K of RAM; compatible with the unenhanced IIe only.)

~~$24.95~~

Order No. **A03** Artist **$14.95**



SCREENER

■ **SIR** is a collection of smart "input anything" routines for DOS 3.3. When you're writing Applesoft programs under DOS 3.3, getting input from the keyboard can be a big frustration. The Applesoft INPUT statement is inadequate for trapping errors, and it limits the range of characters and numbers you can enter. SIR allows your program to get data from the keyboard or disk, ignoring control characters and accepting normally "illegal" characters like the comma and semicolon. You can also use SIR to take special actions if you press the Escape or Return key. Finally, a special command turns a section of the keyboard into a numeric keypad for easy number entry. The ultimate input module!

■ **Screen Input and Display Formatter** give you fast and easy screen design. Produce professional-looking data entry screens for your own Applesoft programs with a minimum of fuss! Just attach this set of subroutines to your Applesoft programs. They make designing input screens and screening user input simple.

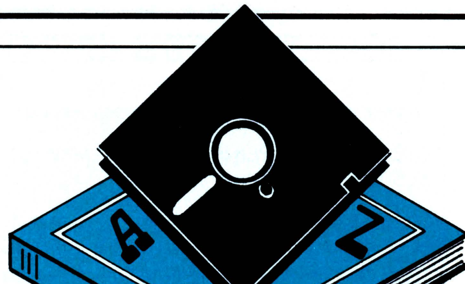
■ **Auto Screen** lets you create a "magic cursor" bar in your Applesoft programs for menu item selection under arrow key control. Using Auto Screen you can create an error-free Applesoft program segment for even a complex selection screen in just a minute or two. Just fill in the blanks, add a program line, and your magic menu is automatically created — magically!

■ **Screen Spinner** builds eye-catching screen borders by spinning your message around the perimeter of the screen. Messages may be any length up to 255 alphanumeric characters — flashing, inverse, or mixed.

■ **Applesoft Screen Creator** allows you to quickly and easily design text screen displays, and then it automatically generates Applesoft code that you can include in your own programs. Easy, full-screen editing makes design a snap, and you can include normal, inverse or flashing text. Great for speedier, more professional program development!

~~$24.95~~

Order No. **I01** Screener **$14.95**



Home/School Education

BILLBOARDS & BANNERS

Banner Boss creates custom, eye-catching banners for parties, promotions — or any special occasion! Messages can be up to 255 characters long, written in letters two or five inches high, with underlining and emphasized print to add a personal touch. Say it with banners! (Requires a printer.)

Color Billboard turns your Apple into a dynamic electronic billboard for displaying attention-getting messages in 15 different colors. Features include smooth, fast text scrolling and colored blinking lights. The built-in editor lets you create your message, and then immediately view it on Color Billboard. Great for leaving messages for the family at home, using as math or language flashcards in school, or for advertising those special sale items at your store.

Happy Birthday plays the "Happy Birthday" song and displays the words, complete with the birthday person's name. Perfect for your youngster's next birthday.

Electronic Message Center offers the features of a message center system without the big price tag. It's a versatile message handler for entering, editing, and automatically displaying sequences of eye-catching messages. A fun way to pass the word at home or in the office.

Order No. **E06** Billboards & Banners . ~~$24.95~~ **$16.95**

Apple Trig plots your favorite trigonometric functions in Hi-Res graphics. Watch the graph being plotted, and then overprint graphs to make comparisons. Apple Trig lets you graph the sine, cosine, tangent, cotangent, secant and cosecant functions. The X- and Y-axes are scaled and numbered, and the input routine is user friendly, so students can use the program by themselves. A great learning tool for home or school.

Mathemagician makes solving word problems magically easy. Your children's wits and mathematical skills are their weapons in this exciting adventure game. They'll love solving the mathematical word problems to unlock doors, discover hidden treasure and escape lethal perils. Modify the program to include your own drills, and perhaps a magic spell or two. Your child wins two ways: with the satisfaction of solving an intriguing puzzle, and with stronger math skills picked up along the way!

Math Concentration puts a new twist on an old theme. To win, your child must uncover matching colored pictures and solve math problems. Math Concentration facilitates memorization and the development of basic math skills — the fun way. A super learning tool, especially for elementary level students.

Order No. **E05** Mathemagician . . . . . ~~$49.95~~ **$16.95**

WORDS AND NUMBERS

Flashcard takes the drudgery out of math drill! Pace the speed of the drill to suit the learner: fast or slow with one or two chances to give the correct answer. To help the learner see his or her progress, Flashcard plots a colored bar graph of successes and re-displays any problems the learner missed. With Flashcard, kids can both enjoy using the Apple and learn their math tables.

Universal Metric Converter converts English and metric units with menu-driven ease. How many milliliters in a gallon? What's your weight in kilograms? Forget all those conversion factors, and let this program do the work for you!

Trivia Master never lets you run out of questions because it lets you make up your own, and then challenge your family to beat the clock answering them. The quicker responses receive higher scores — if you're right. Because you can adjust the difficulty level of questions, Trivia Master can be challenging and entertaining for all ages. Questions are easy to update, and none are repeated in the same game. Trivia Master includes a file of 200 questions to get the party going.

Word Find lets you make your own hidden word puzzles of any size up to 40 rows and 40 columns. Then print them out on your

MATHEMAGICIAN

Math Monster makes scary fun out of math learning. Can your children solve the multiplication or division problem before the Math Monster gobbles them up? That's the challenge — and the fun — of learning math facts with this Hi-Res graphics game. Each time a problem is answered correctly, the little Professor moves farther away from the Math Monster and closer to a hammer. When your child wins, the Professor runs across the screen and whacks the monster soundly. But, if they don't learn those multiplication and division facts, watch out! The Math Monster will eat them up!

Math Marathon is a math practice program that drills your children in addition, subtraction, multiplication and division. Varying levels of difficulty will help keep your kids in the running for good grades in math proficiency tests!

CLASSROOM MANAGER

BEST nibble SELLER

Nibble Grade Book get high grades from teachers! It easily tracks and analyzes test scores, then calculates the grades for up to 10 classes of 80 students each. This versatile program lets you store test grades and test descriptions, calculate cumulative grade points and percentage grades for each student. Grade Book lets you assign letter grades and determine the mean grade and standard deviation of a test. You can even drop the lowest test grades and adjust test scores for the entire class. Then, with all your work completed, you can print out a grade report. An indispensible tool for all teachers!

Personal Appointment Calendar keeps track of up to 15 memos per day for a year's worth of appointments. And if you like to see everything in writing, just select and print out the appointments you need for quick reference.

Executive Card File gives you the flexibility of an index card file, with the electronic advantages of easy data entry and editing, speedy sorting and disk-based storage. The primary advantage of an index card system is its flexibility: data can be entered and organized in virtually any manner. Each "card file" may contain up to seven sections, delineated by dividers. Within each section, as many as 35 index cards can be stored, and each card can hold nearly 500 characters. Once filed, index cards can be displayed, edited, sorted, removed or printed to a printer.

Order No. **E01** Classroom Manager . ~~$29.95~~ **$26.95**

printer, with clues and a separate answer sheet. Finding the words embedded in letter mazes is fun for young and old. (Requires a printer.)

■ **Life** is a fascinating simulation of the birth, survival and death patterns of colonies of cells on your Apple screen. It is a version of the incredibly popular game of Life that was originally published in *Scientific American*. You set up a starting colony of cells and watch generation after generation evolve, grow, migrate, move and behave in completely unpredictable patterns. A unique and entertaining educational simulation.

■ **Binary Clock** is an amusing and unusual timepiece for the dedicated programmer. It displays an accurate machine language timepiece in Lo-Res graphics. Put aside your ordinary clock and view the current time as your Apple does — in 8-4-2-1 binary code!

Order No. **E04** Words and Numbers . ~~$19.95~~ **$14.95**

SCIENCE AND FUN

BEST nibble SELLER

Explore the fascinating world of scientific discovery.

■ **Nibble Planetarium** has many of the features of a real planetarium. This Hi-Res star charting system displays and prints the sky from any location in the Northern Hemisphere at any time of the year. Point to a star, and the Nibble Planetarium gives you its name; reverse the process by asking for a star by name. A special mode lets you view the night sky and see how it changes with the passing hours. A great learning tool for amateur astronomers! *Bonus:* Includes a special unpublished file that includes all the major constellations — over 600 stars!

■ **The Serpent's Coil** traces the destructive paths of the hurricanes. From July to October, hurricanes snake through the Gulf of Mexico and the Caribbean on a collision course with the U.S. coast. Now you can track hurricanes on the Hi-Res screen, and then plot, scale, and label them for printer output. Plot data for new storms, or track eight historic hurricanes, such as the Great Galveston Storm of 1900, Camille (1969), and Alicia (1983), that are included on the disk. Features include easy data entry and updating, single or multiple storm plots, and scaling and labeling of charts.

■ **Direction Fields** displays the intricate patterns of direction fields in Hi-Res graphics using the mathematical function you supply. Wind directions, patterns of iron filings in a magnetic field, ocean currents and air flow patterns are just some of the scientific possibilities you can investigate. For relaxation, you can also create fascinating abstract patterns.

Order No. **E08** Science & Fun **$29.95**

MORE SCIENCE AND FUN

■ **Weather Station** records daily weather data and prints monthly weather charts and reports. A great tool for amateur meterologists!

■ **Sunrise, Sunset** calculates the exact times of sunrise and sunset for any day of the year.

■ **The Translator** is a foreign language dictionary and translator you can compile in the language of your choice. It stores hundreds of words, definitions and notes.

■ **Word Elevator** is a word skill game that teaches your child about alphabetical order. Your child's understanding will rise as he or she moves words from floor to floor.

Order No. **E11** More Science & Fun . . . ~~$24.95~~ **$19.95**

MATHLAND REVISITED

■ **Nibble Calculator** turns the Apple into a full-function, programmable calculator with built-in arithmetic and trig functions, plus provisions for five user-defined programs.

■ **Polar Plotter** plots an equation up to 200 characters long using polar coordinates.

■ **Nibble Plotter** graphs user-defined functions or data sets. It performs curve fitting and prints legends, captions and multiple plots.

Order No. **E12** Mathland Revisited . . ~~$24.95~~ **$16.95**

APPLESOFT TUTOR

Become an Applesoft pro, with this trio of patient tutors.

■ **Applesoft Tutor** actually modifies Applesoft BASIC so it displays detailed, explanatory error messages for 100 different errors. One of the biggest barriers to learning Applesoft BASIC programming is cryptic error messages. You'll pinpoint and correct problems more easily, and learn Applesoft concepts faster. (Requires at least 64K of RAM.)

■ **Applesoft Programming Helper** is an invaluable programming aid. Up to 80% of your programming/typing errors produce the dreaded SYNTAX ERROR. Normally you have to RUN your program to discover them. With Applesoft Programming Helper, you can save time and effort by checking the syntax in every line of your program — before you RUN it!

■ **Applesoft Execution Monitor** helps you fine-tune your Applesoft programs. It displays a chart that shows which program statements are executed most often, so you'll know where to cut back in order to improve performance. A powerful tool for optimizing Applesoft programs. (Requires an 80-column card and at least 64K of RAM.)

Order No. **E09** Applesoft Tutor . . . . . . ~~$29.95~~ **$19.95**

THE STATISTICIAN

■ **Nibble Plotter** graphs user-defined functions or data sets. It performs curve fitting and prints legends, captions and multiple plots.

■ **Regress** provides video and printed regression analyses.

■ **Pearson Product Moment Correlations** calculates a complete correlation matrix from your statistical data.

Order No. **E13** The Statistician . . . . . . ~~$24.95~~ **$17.95**



TITAN +

■ **Titan Cronus** pits you against the ancient gods in fast-paced, animated arcade battle action. Can you control the chariot of Zeus with its awesome lightning bolts and fend off the waves of attackers? Your enemies are Titan Cronus and his mighty allies: the Cyclops, Chimeras, Giants and the Furies. Many levels of play make for hours of action-packed, Hi-Res color entertainment — if you can survive!

■ **Obelisk** challenges you to pilot your rover vehicle over unknown terrain to save the hijacked mother ship. But watch out for the death rays from alien ships and sensor-controlled obelisks. Don't fail this mission or the world is destroyed! Blistering machine language speed and Hi-Res action.

■ **Ants!** is sci-fi gaming at its best! Radioactive wastes seeping into the soil have turned ordinary garden ants into giant, mutant monsters bent on destroying the planet. Armed with an electro-sonic disrupter gun, you must exterminate the killer ants before they can dig a path to the surface. Use the keyboard, game paddles or joystick in this Hi-Res action game to stop the deadly ants.

Order No. **G04** Titan + ... ~~$19.95~~ **$13.95**

COMMANDER

Man your battle stations!

■ **Nibble Beach Head** puts you in command. Lead your troops across the beach head to destroy the enemy machine gun emplacement, while avoiding mortar attacks and machine gun fire. Each soldier is equipped with only a rifle and two grenades. However, the enemy has snipers, machine guns, mortar shells, barbed wire and mine fields. Sound effects and Hi-Res graphics add great realism to this military challenge. A must for war game and strategy fans.

■ **Tank Combat** simulates the deadly struggle of World War II tank combat. Strategy and foresight are the keys to winning, as you maneuver to defend your HQ, ammo dump and fuel depot against enemy fire. Use your six tanks wisely, or you won't survive the night.

■ **Artillery Duel** is a realistic artillery simulation with a twist of math. From opposite sides of a mountain, you shell your enemy's encampment. The best judge of fire power, barrel elevation, and a fickle wind will survive. This Hi-Res action game features varying difficulty factors, including special optional calculations that will fascinate the math buffs.

■ **Atlantic Convoy** pits your navy against the enemy in an all-out struggle for possession of the Atlantic. You need strategy and skill to maneuver your fleet of thirteen vessels: two carriers, two destroyers, three submarines, four advanced support vessels, and two tankers. Each type of vessel has unique attack, defense, and movement capabilities. Can you defeat the enemy before you run out of fuel or get sunk? Great two-player entertainment on the Hi-Res high seas!

~~$49.95~~
Order No. **G05** Commander **$14.95**

GHOST GOBBLER

A-mazing fun!

■ **The Nibbler** is the classic dot-gobbler: eat all of the dots in the maze while avoiding orange ghosts! Gobble the colored dots, munch on an energy cube for that extra boost of power, and keep progressing through mazes of increased difficulty. A feast of fun!

■ **Clam Bake** makes you the hapless, hungry clam trapped in a kelp bed. To survive you must outmaneuver the deadly jellyfish, eat all the diatoms, and advance through the seaweed mazes. Four life-saving pearls are your only weapons. Clam Bake features machine language speed, professional stop/start options and optional sound effects.

■ **Speed Maze** challenges you to navigate a randomly generated maze as fast as you can. The wide range of selectable speeds makes the game fun for both novices and experienced players. And if you're a programmer, you'll find a fascinating algorithm for generating mazes and a unique method of creating and controlling movement of the Lo-Res graphics screen.

~~$49.95~~
Order No. **G10** Ghost Gobbler **$14.95**

ELECTRIC ARCADE

■ **Formula Nibble** puts you behind the wheel of a Grand Prix race car taking the curves at top speed. Three super-realistic, full-color Hi-Res tracks simulate races on actual Grand Prix circuits. Start your engines!

■ **Voratio** is the hungry space worm. Guide it in search of food through your choice of 19 challenging levels.

■ **Othello and Seawolf** are two games: an ancient strategy game, and a simulation of torpedo warfare waged on the Hi-Res seas. (Requires paddles or joystick.)

~~$49.95~~
Order No. **G14** Electric Arcade **$16.95**

CREATIVE PURSUITS

■ **Movie Construction Set** turns your Apple into a movie camera and projector. Draw and direct a cast of cartoon characters in fast, smooth Hi-Res animation. The only thing missing is a Hollywood premiere!

■ **Funny Face** lets kids create dozens of clown faces in Hi-Res colors with just a few keystrokes. Your kids will love the interchangeable, funny features on their own clowns.

■ **Banner Maker** prints banners sideways for maximum impact, using a variety of letter sizes.

~~$49.95~~
Order No. **G16** Creative Pursuits **$17.95**

High Performance Utilities

SORT LIBRARY

With Sort Library in memory, your programs can handle massive amounts of data with machine language ease.

■ **Quicksort II** is the most powerful machine language sort we've ever published! It rapidly sorts one- or two-dimensional string arrays, integer arrays and floating-point arrays. Sorts may be in ascending or descending order, and you can sort an entire array, or any part. You can even specify sorts on multiple levels; for example, you can sort an address list by zip code, and by last name within a zip code.

■ **Quicksort** gives you plenty of Applesoft sorting power packed into less than 600 bytes of machine language code! It sorts one-dimensional Applesoft string and numeric arrays in ascending order. An indexing option lets you include a "tag" for indexing random access text files, dates, etc.

■ **Amper-Jump and T-Sort** are specialized routines that sort Applesoft strings stored as records in a DOS 3.3 random access text file, along with associated numeric "tag" arrays. By storing your file's record numbers in the "tag" array, you'll be able to quickly sort on any key in your random access file without physically rearranging the records. Also suitable for any other string array sorting.

■ **Speed Sort** is a speedy machine language routine that sorts Applesoft string arrays up to 60 times faster than Applesoft. Includes instructions for attaching the routine to your Applesoft programs — no BLOADing!

■ **Compact Sorter** has special features for sorting Applesoft string arrays in ascending or descending order. It also allows you to sort the entire array or just a part of it.

■ **How To Sort Five Ways** is a case study of five different Applesoft sorting techniques that includes demonstration benchmarks.

~~$29.95~~
Order No. **U01** Sort Library **$19.95**

AMPER POWER 1

A collection of quick and easy utilities to dramatically improve program performance.

■ **Amper-Interpreter** is the efficient way to add machine language functions to BASIC. You CALL the functions using the ampersand and a descriptive name instead of an easily forgotten number. Amper-Interpreter is the basis for a powerful utility library. Included are such valuable modules as PRINT . . . USING, for easy formatting of string and number output.
■ **Amper-Reader** cuts the file management bottleneck down to size! Tired of waiting around while your program reads large text files? Amper-Reader dramatically reduces processing time. It speed-reads sequential text files 5-10 times faster than DOS 3.3. A "must" for big file jobs!
■ **Amper-Print-Use** formats numbers and text neatly, easily and far better than any Applesoft routine can. It simulates the PRINT . . . USING command for easy alignment of column headings, decimal and scientific notation, left and right justification, and more. A unique programming utility!
■ **Amper FRE Splitter** lets you control exactly where your Applesoft programs go in memory. This utility allows you to free up any area of your Apple's memory, so you can wrap Applesoft programs around protected memory areas — a key advantage for your graphics or machine language routines.

~~$29.95~~
Order No. **U02** Amper Power 1 . . . . . **$16.95**

AMPER POWER 2

■ **Amp-L-Soft** is an entire library of utilities under ampersand control that make your programming easier — at machine language speed! Amp-L-Soft lets you manipulate strings by sorting string arrays, and searching for substrings within strings. A versatile "input anything" routine eases your data input programming. A flexible tone generator lets you customize the sounds coming out of your Apple's speaker. You can even change the contents of the 6502's registers while calling machine language routines! Instructions are included for adding your own ampersand routines.
■ **Amper Free Space Catalog** quickly determines how much free space remains on your disk. Just key &<RETURN> and the Amper Free Space Catalog program will tell you. It's as easy as that!
■ **Amper-Find** is a fast, compact search routine that locates variables, strings, commands, and even control characters within an Applesoft program, and prints out the corresponding line number(s). It resides in page 3 of memory, so it can be loaded at any time without altering your Applesoft program. Its uses include locating GOTO and GOSUB commands to facilitate the deletion of REM statements, searching for a variable to determine whether it is free to be used, or even finding a misspelling that you noticed while running a program.
■ **Amperspeed** supercharges DOS 3.3 to speed up text file operations by 300%! You can choose to read or write an entire text file, or just a partial segment. As an added bonus, there's an option to free up memory by deleting string arrays after your program has finished using them.

~~$29.95~~
Order No. **U03** Amper Power 2 . . . . . **$16.95**

SUPERCHARGER

Power-up your programs!

■ **Applesoft Supercharger** gives your programs machine language speed. Use this library of ampersand routines to format output, control user input, chain programs with common variables, perform bit operations, change the tone of the error bell, and much more.
■ **Amperpacker/Unpacker** compresses Applesoft strings as much as 33%, saving room in memory and on disk. Working with large text files? Running out of disk space? Let Amperpacker/Unpacker squeeze your text files into manageable size. Unpacker "decompresses" the text when it's time to print it out or view it on screen. Great for telecommunicating text.
■ **Ampergo** lets you write Applesoft programs using labels (names) instead of line numbers in GOTO and GOSUB statements, e.g., GOSUB USER INPUT instead of GOSUB 43102. Thus, you can quickly determine the subroutine's functionality. This is especially helpful for longer programs, which usually contain many subroutines. Makes your programs easier to read.
■ **Input and Edit** expands the capabilities of the Applesoft INPUT statement. You use ampersand commands to insert leading and trailing spaces, commas, colons, and quotes within input strings. Plus, the program includes many powerful editing commands.

~~$29.95~~
Order No. **U04** Supercharger **$16.95**

APPLESOFT COMMANDER

■ **Window Magic** creates Mac-like windows on the Apple screen that you can move on and off the screen, or on top of each other. Windowing lets you create "miniature screens" to direct attention where it's needed. It also enables you to create virtual screens that can be larger than the actual screen display. Create any size window, overlap windows, and use them for gathering input and displaying output.
■ **Subroutine Store** is an electronic filing cabinet for your Applesoft subroutines. It works automatically — simply add new subroutines to Subroutine Store whenever you like. When it comes time to write a new program, just specify the subroutines you'd like to include. Subroutine Store will combine these subroutines into a single section of Applesoft program code — using the line numbers that you specify — and save the section to disk as the starting point for your new program. Drastically reduces program development time!
■ **Disk Commander** lets you access files with names of any length quickly and efficiently. Long, descriptive program names are informative but time-consuming to enter. The DOS 3.3 CATALOG command usually scrolls the catalog too fast to be of value. Enter Disk Commander, a convenient and easy-to-use solution. This utility sequentially numbers the files in the diskette directory, then lets you use the number assigned to a given file to perform the various DOS functions on that file. Your typing is reduced even further, since only the first three characters of any DOS command are required for proper function.
■ **Subroutine Master** adds real subroutine handling to Applesoft. Now you can build a library of Applesoft subroutines that behave much like Pascal procedures. Features include the ability to refer Applesoft to subroutines by name, two-way parameter passing, recursion, nesting and local variables.

~~$24.95~~
Order No. **U05** Applesoft Commander **$14.95**

BEST nibble SELLER

POWER PROGRAMMER

■ **Split Personality** divides the Apple IIc or 128K IIe in half — for twice the program power. With two 64K machines in one, you can run two Applesoft programs at once and switch between them.
■ **Universal Applesoft** is a set of sophisticated I/O routines that allow you to write a single program that runs on the II Plus, IIe, enhanced IIe and IIc, with or without 80-column card.
■ **Window Show** uses five easy commands to open Mac-like shadowed windows on the Hi-Res screen.
■ **AmperFormatter** formats the text in your programs with automatic word wrap, page breaks and lower-case to upper-case conversion.
■ **Super Sort** is a high-speed sorting utility that rearranges up to eight tag-along arrays when it sorts the key array. A demonstration deals bridge hands.

Order No. **U06** Power Programmer . . **$29.95**



Programming Productivity

BUG BLASTER

Five powerful tools for bug-free programs.

■ **Applesoft Bug Chaser** tracks down bugs wherever they hide. Debugging is much easier with this machine language utility that traces and displays the values of variables while your Applesoft program runs. You control the program's execution speed, while the value of any selected variable is displayed in the lower-right corner of your screen. Other features include easy selection of the trace variable and an ampersand connect/disconnect switch. Now you can easily determine where and how problems occur.

■ **Applesoft Programming Helper** eliminates 50-80% of your program errors before you run your program. It checks your syntax in advance, detecting several types of errors in an Applesoft program, especially typing mistakes that result in SYNTAX, TYPE MISMATCH and UNDEFINED STATEMENT errors.

■ **Variable Cross Referencer** makes writing and documenting bug-free programs even easier. With the Variable Cross Referencer, you can quickly display or print an alphabetized list of your variables, together with the program line numbers where they occur. A marvelous debugging aid!

■ **Trap/Step** is a valuable interactive Applesoft debugger that lets you set traps for any lines in your Applesoft programs. When the trap is encountered, program execution stops, and you can examine variables, list lines, etc. You can then set new traps, display all set traps, and/or resume program execution. There's also a command to let you step through your program slowly by executing just one line at a time.

■ **Applesoft Line Finder** tells you everything you ever wanted to know about Applesoft lines! It provides the absolute memory location for any Applesoft line you specify, and describes how and where your program is stored. You'll instantly see the program's starting and ending locations, the amount of available free space and the locations for the beginnings of strings, simple variables and array storage spaces. Armed with this valuable information, you can perform Applesoft tricks like hiding lines, using illegal line numbers — and even improving program efficiency!

~~$29.95~~

Order No. **P01** Bug Blaster **$19.95**

APPLESOFT STREAMLINER

Pare program execution time to the core!

■ **Applesoft Execution Monitor** optimizes the performance of your Applesoft programs where they need it most. Inefficient routines can slow down your programs — even ones that appear well-structured. Applesoft Execution Monitor (AEM) spots the program statements that are executed most often, and prints a chart showing the relative execution frequency of each line. After modifications, you can rerun your program and let AEM show the extent to which you have decreased (or even increased) execution frequency of those lines. A powerful tool for optimizing Applesoft programs. (Requires an 80-column card and 64K of RAM.)

■ **Applesoft Line Cruncher** goes to work on your program to save memory and increase speed. This utility automatically compresses multiple Applesoft program lines, joining them wherever possible, to create compact multi-statement lines. When two lines are combined into one, you save four bytes of memory. If multiple lines are combined, it's easy to see that the savings in memory really add up. A powerful program utility that automatically develops compact code!

■ **Applesoft Anti-Line Cruncher** expands multi-statement Applesoft programs so that you can see each statement on its own line. A screen display reports on the action as your program is expanded and renumbered. To save time and space, "crunch" your program; but to maintain a program with individual lines for easy readability, use the Anti-Line Cruncher.

■ **Super REM Remover** saves memory and improves execution speed by removing REMs from Applesoft programs and producing more compact code. This enhanced REM remover intelligently combines lines to optimize your program. Now you can have two versions of your program: a speedy, REM-less version and a fully documented program listing for reference.

■ **Applesoft Variable Cruncher** compresses long variable names to one or two letters, saving bytes of memory and dramatically increasing execution speed. Even better, you get the benefits of a shortened program without having to do any tedious manual editing.

~~$29.95~~

Order No. **P04** Applesoft Streamliner **$19.95**

MACHINE LANGUAGE MASTER

BEST nibble SELLER

Take the pain out of machine language!

■ **Machine Language Editor** makes entering and editing machine language programs as easy as using a word processor. If you make a mistake and leave out some code, Machine Language Editor lets you go back and *insert* the missing bytes. Or if you mistakenly insert extra characters, Machine Language Editor lets you *delete* them, and the rest of the program fills in the space. To *edit* mistyped bytes, all you do is move the cursor over the incorrect characters and retype them. Imagine the time you'll save and the frustration you'll avoid. A must for your library.

■ **Hexpad** is another tool to minimize the tedium of entering lengthy machine language programs. A phantom keypad provides fast, easy entry of hexadecimal data by using 16 keys on the Apple keyboard. The screen is formatted to allow rapid comparison between the original data and the values that you enter. No more hunting and pecking through the top row of keys.

■ **ASCII.Dump** demonstrates the use of opcodes and pseudo-opcodes, and allows you to examine the Apple's memory. ASCII.DUMP lets you stop, pause, restart and step through a hex dump at your own pace. First published in the popular Nibbling at Assembly Language column, this program also prints the hexadecimal values of numbers stored in memory and their ASCII equivalents.

■ **Hex Sequence Finder** makes fast searches for all occurrences of a one- to fifteen-byte sequence of hexadecimal numbers in memory. Use this speedy utility to debug your machine language programs or find Applesoft and DOS commands. You specify the area of memory to be searched and Hex Sequence Finder will scan it for the hex numbers that you choose — instantly!

Order No. **P02** ML Master **$29.95**

NIBBLE BASIC

Essentials for BASIC programmers.

■ **Nibble Programmer** lets you write structured Applesoft programs without cumbersome line numbers, and adds the powerful new commands LOOP and WHILE. You can name your subroutines with terms like GOSUB TOTALS for easy recall and automatic documentation. Programmer then writes your Applesoft program for you!
■ **Power Key** puts Applesoft power at your fingertips. No more typing in full commands; just press a user-defined key and it's done! Use Power Key for simplified entry of DOS 3.3 commands and program statements. Definitions can be edited and saved on disk for later use. Dramatically reduces program typing.
■ **Applesoft Overlays** ends the conflict between long programs and available memory (such as the Hi-Res graphics pages) under DOS 3.3. This machine language program solves the memory shortage problem by breaking your long Applesoft program into segments and storing them on disk. You can even add code without disturbing your variables — a true chain function. No more OUT OF MEMORY errors!

~~$29.95~~
Order No. **P09** Nibble BASIC **$19.95**

BASIC ASSEMBLER

Machine language programming the easy way!

■ **BASIC Assembler** produces machine language programs quickly and easily. Machine language programs run much faster than their Applesoft counterparts, but writing them can be much more difficult. This 6502 assembler (written in Applesoft) and its companion source editor simplify the task of writing programs in assembly language.
■ **BASIC Assembler Enhancements** adds professional features to the BASIC Assembler. Now you can have printouts of the assembled listing that look just like the ones in *Nibble* and those produced by commercial assemblers. You can also add full-line comments and two new pseudo-ops: ASC and HEX. Modifications to the editor allow 80-column editing and more foolproof error trapping. (Requires an 80-column card.)
■ **BASIC Disassembler** translates machine language code into symbolic source code that your assembler can read. Use it with the BASIC Assembler or Apple's DOS Tool Kit to modify, correct or enhance programs for which you have no source code. There's also a provision that allows easy customization for use with other assemblers.
■ **Machine Code Editor** reduces the tedium and potential problems of typing large machine language programs from books and magazines. It checks the validity of your entry by comparing it to the original, and shows you a disassembly as you enter each line of code. Use this Applesoft program to enter assembly language program listings, shape tables and data tables. And if your evening isn't long enough to code the entire program, save it and continue another day.

~~$29.95~~
Order No. **P08** BASIC Assembler **$26.95**

APPLESOFT EDIT LIBRARY 1

■ **Search and Replace** performs two important functions: it lists all program lines that contain a given string, and it replaces one string with another throughout the program. Save yourself time and aggravation by using Search and Replace to automatically scan and globally or selectively replace strings and variables in your Applesoft programs.
■ **Applesoft Global Editor** gives you another option for changing variable names or strings throughout your Applesoft programs. Let this powerful editor perform the search and replace operations over a selected line range or throughout the entire program. You choose whether to display replacement lines on the screen. Global editing becomes as easy as reading a menu!
■ **Poor Boy's Line Editor** is an editing program with many useful editing aids that are transparent to your Applesoft program, such as start/stop listing, fast cursor advance, and line truncation. (Not compatible with the IIc).
■ **Applesoft Variable Dump** provides a complete list of your variables and their values at any time during program execution. Dumping the values of all program variables gives you a snapshot of the state of the whole program and lets you find problems faster and easier. It's program debugging made easy!
■ **Apple Concordance** keeps track of variables so you can add to an existing Applesoft program or make changes. It minimizes the potential for mistakes by alphabetically listing every variable and the line number where it appears. The easy-to-read format makes it a snap to cross-reference variables and modify your code without hesitation. A very powerful utility.

~~$29.95~~
Order No. **P06** Applesoft Edit Library 1 **$17.95**

APPLESOFT EDIT LIBRARY 3

State-of-the-art tools to streamline your program editing.

■ **Mr. Ed** is a smart, efficient program editor. It features autonumbering, line editing, and insert, delete and tab functions.
■ **Applesoft Compare** lets you load two versions of a BASIC program into memory and compare them. It lists the numbers of all missing, extra and changed lines.
■ **Auto Menu** lays the ground work for you. It creates the shell of a BASIC menu-based program. When you enter your menu options and line ranges, Auto Menu supplies the program lines.
■ **Microscope** is a debugging tool that lets you trace the execution of an Applesoft program with a number of speed and display options.

~~$29.95~~
Order No. **P11** Applesoft Edit Library 3 **$19.95**

SEARCHPAK

Find it . . . fast!

■ **Search and Replace** performs two important functions: It lists all Applesoft program lines that contain a given string, and it replaces one string with another throughout the program. Save yourself time and aggravation by using Search and Replace to automatically scan and globally or selectively replace strings and variable names in your Applesoft programs. Great for checking whether variable names have already been used as you add new ones.
■ **Simple Search** is a fast machine language search program for Applesoft string arrays. It scans an array for all occurrences of the string you specify. The result is an incredible reduction in the execution time required to complete a search.
■ **Fast File Search** won't keep you waiting. This marriage of machine language and BASIC programming makes your DOS 3.3 random access file searches up to 20 times faster.
■ **MON.E** is an extended Monitor for the IIe and IIc. This utility lets you examine the full range of memory up to 128K. (Requires at least 128K of RAM; not compatible with the Apple II Plus.)

~~$49.95~~
Order No. **P03** SearchPak **$14.95**

MACHINE LANGUAGE TOOLBOX

■ **Software ROM Writer** creates a custom ROM and stores it in RAM. You can use it to "permanently" modify the Apple bell, text windows, cursor, Applesoft commands, error messages and more.
■ **65C02 Disassembler** expands the Monitor's disassembler to include the entire 65C02 instruction set. A boon to assembly language programmers!
■ **ProCursor** customizes your IIe or IIc with a solid blinking box cursor or any cursor character you choose.

~~$19.95~~
Order No. **P12** ML Toolbox **$14.95**

APPLESOFT SPEED PACK

■ **Tiny Compiler** executes your Applesoft programs up to 20% faster. This BASIC post-processor modifies Applesoft in the RAM card area of memory. The result is a smaller, faster program. (Requires at least 64K of RAM.)

■ **Applesoft Expander** adds powerful new commands to Applesoft to increase its capabilities. This valuable collection of machine language routines for your DOS 3.3 Applesoft programs will expand the command repertoire, simplifying programming development and speeding execution. Easy ampersand-driven features include: Hi-Res graphics text, hexadecimal PEEK/POKE and computed GOSUB/GOTO, an "input anything" routine, and a faster, named GOTO statement. (Requires at least 64K of RAM.)

■ **SAV-DEL** frees up memory by allowing you to selectively delete one or more arrays while your Applesoft program continues to run. You can also choose to delete all variables except one or more selected arrays for more efficient program chaining.

■ **Fast GO-TO Processor** speeds up your favorite Applesoft programs. You can double the execution speed of GOTO and GOSUB commands — automatically!

■ **Apple Initia** sets and resets Applesoft arrays with values you specify at blinding machine language speed. (For example, a 10,000 element array is filled in only 2.5 seconds!) Great for instantly setting all numeric or string array elements to zero or any other value.

~~$29.95~~

Order No. **P10** Applesoft Speed Pack **$14.95**

DOCUMENTOR

Give your program listings that professional look.

■ **Navigator** makes program documentation a breeze! It's a BASIC listing utility and flowchart formatter that reformats Applesoft listings and prints flowcharts complete with graphics symbols. Simplify the tasks of modifying programs and checking the logic by producing top-notch documentation with Navigator. (Requires a printer.)

■ **Pretty Lister** gives new character and clarity to your listings. It formats and indents your multi-statement lines so they emerge with that structured programming look. Indentation of FOR–NEXT loops and IF–THEN blocks helps you visualize the logic structure of Applesoft programs. Logical errors are easier to identify, and programs are easier to read. (Requires a printer.)

■ **List Master** prints a formatted listing of your Applesoft programs that highlights REM statements, indents FOR–NEXT loops and IF–THEN statements, and separates each command on a separate line for easy-to-read listings. (Requires a printer.)

■ **Compare Applesoft** lets you compare different versions of your programs for changes, additions and deletions. Use it when you modify programs and want to share your enhancements with others, but can't remember exactly where you made the changes. This is an absolute *must have* program for keeping track of constantly revised programs.

~~$29.95~~

Order No. **P05** Documentor **$17.95**



DISK FIXER

The right tools for fixing disk problems.

■ **Disk MAP System** is a road map to your DOS 3.3 disks, showing you the exact location of your files and how much space they occupy. Choose whether to display and verify each and every sector on the disk, or to display a list of sectors used by a particular file. Automatic sector verification lets you know if some sectors are damaged, indicating that repair is needed. Documentation includes hints for fixing damaged disks.

■ **Disk MAP II** uses a snapshot method to instantly display a complete map of the disk, including all of the occupied and free sectors, *on just one screen*. The display includes a code to the names of the files, so you can see exactly where your files reside on the disk. You can specify the disk drive and slot, and choose to send the map to the printer for closer study.

■ **Disk Zap** zooms in for more detailed examination and repair. It reads the contents of a disk sector and displays them on the screen in hexadecimal and ASCII format. You can then examine, edit and print out the sector's data, and "zap" the disk by writing the modified contents back onto the disk. Simple, one-key commands let you step backward and forward to view the next or previous sectors. Or have fun by creating hidden file names, modifying DOS and more! Includes detailed instructions for repairing a variety of disk problems.

■ **Disk Doctor** finds the cure for sick disks. It recovers accidentally deleted files — automatically! There's also an option that lets you remove DOS from your disks, creating unbootable data disks that let you store an additional 32 sectors of information — over 8,000 bytes!

~~$24.95~~

Order No. **D02** Disk Fixer **$14.95**

DISK/PROGRAM PROTECTOR

■ **Disk Lock** protects your valuable files by locking the entire disk. It fools DOS 3.3 into believing that your disk is full, so that no more files may be added. Change your mind? No problem! A simple command will restore the actual VTOC and unlock the disk.

■ **Disk Certifier** instantly doubles your disk's capacity. This disk utility for DOS 3.3 scans and initializes both sides of your disk and marks off all defective sectors so they will not be used by DOS — all in less than two minutes. Take the worry out of flipping your floppy!

■ **Encode-Decode** encodes your programs so that only you, the keeper of the key, can use (or even list) the programs. It uses an encoding key that is extremely difficult to decode. Encode-Decode works equally well on Applesoft BASIC, Integer BASIC and binary files. Once your program is encoded, you can save it back to disk. Prying eyes will see only gibberish.

■ **Program List Protector** prevents your hours of work from being pirated or changed by unauthorized persons. Your Applesoft programs can be listed or run only when your own special code word is used. The program differs from other protection methods in that the program is always protected, even before it has been run. And you don't have to be a computer expert to use it.

~~$24.95~~

Order No. **D01** Disk/Program Protector **$14.95**

DISK LIBRARIAN

BEST nibble SELLER

A complete library of powerful disk utilities.

■ **Disk Librarian Pro** catalogs all your disks and instantly creates a quick-reference master list. Wondering which of a dozen disks holds the file you want now? Disk Librarian Pro has the answer! As fast as you can put disks in your drive, it reads and stores the catalog information, and records whether it's a DOS 3.3, ProDOS or Pascal disk. You can display, sort and print hundreds of file names. The master list can even be transferred into AppleWorks or other editor programs for more formatting.

■ **Sector Stretcher** gives your data room to grow. It clears up to 45 extra sectors, stretching the capacity of every DOS 3.3 disk you own. Perfect for database users who've seen the DISK FULL error message much too often.

■ **RAM Disk II** ends the disk shuffle. It adds a 16K RAM disk to your system. Now you can store frequently-used utilities on a RAM disk tucked inside Apple memory. You get faster access without using valuable disk space. All disk commands work the same as with your regular DOS 3.3 disks.

■ **Diskoverer** is a fast, powerful DOS 3.3 disk zap program. Use it to rescue your damaged disks or inspect file formats. A range of features let you read from, write to and display any sector, in any of three ASCII formats. You can even display ASCII and hex on a single screen. Diskoverer lets you easily page through a file, then change data or disassemble any portion of a sector. When you like what you see, just dump any screen to the printer, anytime, for a permanent record.

Order No: **D06** Disk Librarian **$29.95**

RAM POWER

Faster than a speeding floppy... RAM Power makes your memory do more for you.

■ **RAM Disk** and a 64K Apple are all you need to create a 16K DOS 3.3 pseudo-disk that gives you the dramatically faster access speed of a hard disk. This program allows you to save and run programs, and read or write text to DOS 3.3 data files on your RAM card disk. Later you can save the contents of the card onto floppy disk for permanent storage. (Requires at least 64K of RAM.)

■ **RAM Disk 64** turns your 128K IIc or IIe with extended 80-column card into a super-fast DOS 3.3 RAM disk drive emulator with 170 sectors' worth of storage. Any unprotected program for the Apple IIc or IIe that uses a disk for temporary storage can benefit. After installation, Ram Disk 64 requires no more memory above DOS, yet it works 60-90% faster than a regular disk. (Requires an 80-column card and at least 128K of RAM; not compatible with the Apple II Plus.)

■ **Hide/Unhide** reveals the mysteries of Applesoft. Unmask the FP and INT command and then use the techniques to hide and retrieve your programs from a RAM memory expansion card or the upper memory of an Apple IIe or IIc. (Requires at least 64K of RAM.)

■ **Nibble RAM Manager** lets you use numerous system utilities such as the editor, renumber and auto line numbering without disturbing the program in memory. This powerful DOS 3.3 utility merges up to ten binary or Applesoft programs into one file. The resultant file loads the original programs into a 16K RAM (memory expansion) card or the upper memory of an Apple IIe or IIc, where they can be easily recalled with the ampersand (&) command. Best of all, since the programs stay in the RAM card until called, they don't hog main memory, and you get instant access at the touch of a key. (Requires at least 64K of RAM.)

■ **RAM Pad** stores frequently-used addresses and routines on an electronic notepad in memory. Instead of searching through manuals, you can review the information you need at the touch of a key. RAM Pad saves up to four pages of text in a 16K RAM card. (Requires at least 64K of RAM.)

~~$29.95~~

Order No. **D03** RAM Power **$19.95**

PRODOS 3

Operating Systems

PRODOS LIBRARY 1

■ **ProMenu** is the perfect startup program for hard disk and UniDisk 3.5 owners. Use it to list all of the files on your disk; then run the program of your choice with a single keystroke. You can effortlessly navigate directories and subdirectories, without typing elaborate pathnames. If you have a ProDOS-compatible clock card in your Apple, it even displays the correct date and time! (Requires at least 64K of RAM.)

■ **ProSIR** is a collection of "input anything" routines for ProDOS that will solve all your input problems. When you're writing Applesoft programs, getting input from the keyboard can be a major frustration. The Applesoft INPUT statement is inadequate for trapping errors, and it limits the characters and numbers you can enter. ProSIR allows your program to get data from the keyboard or disk, ignoring control characters and accepting normally illegal characters such as the comma and semicolon. You can also direct ProSIR to take special actions if the user presses the Escape or Return key. Finally, a special command turns a section of the keyboard into a numeric keypad for easy number entry. The ultimate input module! (Requires at least 64K of RAM.)

■ **ProCursor** displays the solid blinking box cursor on your IIe or IIc. Or select the cursor character that suits your mood. The choice is yours with ProCursor. (Requires an 80-column card and at least 64K of RAM; not compatible with the Apple II Plus.)

■ **Display** spies on your VAR files for easy debugging. VAR files are disk files that contain the names and values of all the real, integer and string variables in your Applesoft programs. They provide a fast, memory-efficient way to initialize program variables and to preserve the current state of a program while it carries out another task. Display makes programming with VAR files easy by giving you a "snapshot" of their contents at any time. (Requires at least 64K of RAM.)

■ **RAM Reservation Center** protects areas of RAM threatened by ProDOS invasion. It lets you reserve or free areas of RAM so that ProDOS won't BLOAD a program on top of a vital part of the operating system. (Requires at least 64K of RAM.)

~~$24.95~~

Order No. **Q03** ProDOS Library 1 .... **$16.95**

PRODOS LIBRARY 2

Get a grip on your ProDOS files!

■ **ProDOS TYPE Command** gives you a quick, simple command for printer or displaying the ASCII version of any file. Simply enter TYPE: *filename* in immediate or deferred mode. To interrupt the output, you just press the Escape key.
■ **ProDOS-DOS 3.3 Doubleboot** lets you boot ProDOS or DOS 3.3 from a single disk. You can choose the system each time you boot up, or have Doubleboot automatically load one system by default. You must own both DOS 3.3 and ProDOS in order to create the Doubleboot system.
■ **Recovering Deleted ProDOS Files** undoes accidental deletes. If you accidentally delete your file, this program will instantly recover it under ProDOS.
■ **ProDOS COPY Command** adds a COPY command to ProDOS for efficient file manipulation. Now you can conveniently copy files while you have a BASIC program in memory, and without resorting to the awkward FILER program. Use it to transfer files from within a BASIC program or an EXEC'able text file.
■ **ProDOS Directory List** lists every file in all the subdirectories on your ProDOS disks. No more searching through subdirectories for the file you want! Includes print options to the 40- or 80-column screen or printer.

~~$29.95~~
Order No. Q04 ProDOS Library 2 . . . **$19.95**

PRODOS LIBRARY 3

■ **Display** makes your ProDOS VAR files work for you! It looks into the VAR files on your disks, and lists the names and values of all real, integer and string variables in your Applesoft programs. An excellent tool for debugging; to efficiently initialize program variables; or to preserve the current state of a program while it carries out another task.
■ **Disk Librarian Pro** catalogs all your disks and instantly creates a quick-reference master list. Wondering which of a dozen disks holds the file you want now? Disk Librarian Pro has the answer! As fast as you can put disks in your drive, it reads and stores the catalog information, and records whether it's a DOS 3.3, ProDOS or Pascal disk. You can display, sort and print hundreds of file names. The master list can even be transferred into AppleWorks or other editor programs for more formatting.
■ **Expanded ProDOS Catalog** displays all of the files on a ProDOS formatted disk — no matter how deeply they are buried in subdirectories. You can even start at a chosen subdirectory level and retrieve all of the file names below that level.

~~$29.95~~
Order No. **Q05** ProDOS Library 3 . . . **$24.95**

BEST nibble SELLER

BUDGET TRACKS

Asset Manager

PERSONAL INVENTORY PROGRAM provides a complete disk based data management system for inventorying and tracking your personal assets. It is invaluable for insurance reporting.
DART (Debt/Asset Reporting System) is a home finance system for projecting future expenditures and debts. Project your net worth and test new investment and debt strategies.
LOAN REDUCTION ANALYSIS projects the effect of interest changes and loan terms in analyzing major financing purchases.
FINANCIER III provides loan reduction calculation, amortization, two types of depreciation, and simple and compound interest.

Order No: **F04** Asset Manager **$12.95**

Reader/Writer

SPRINT SPEED READING is an automatic text/number generator that helps increase your reading speed by up to 100%. It has options for preschoolers up through the adult level of reading.
TINY TYPER is a short, powerful text editor with append, erase, compact, format, and editing of text files.
NIBBLE PAGE EDITOR lets you create up to 8 pages of information with cursor oriented screen editing, printing, or disk storage.

Order No: **H04** Reader/Writer **$12.95**

Leisure Planner

MAGAZINE ARTICLE TRACKING SYSTEM indexes, sorts, and finds key articles in your library.
MUSIC RETRIEVAL SYSTEM is a flexible file management system oriented to cataloging and retrieving your record and tape collection.
NIBBLE TV GUIDE keeps track of your TV program events and displays schedule conflicts.

Order No: **H09** Leisure Planner **$9.95**

Spelling and Time

SPELLING TUTOR lets you specify your spelling list and then reinforces learning by taking letters away from each word until you type it from memory.
COMPASS QUIZ offers drill, practice, and progress tracking for learning the principle directions of the compass in Hi-Res graphics.
TIME TEACHER uses a Hi-Res clock to move the big and little hand to match the time target.
CHICKEN LITTLE'S TYPING GAME teaches you the basics of touch typing. To score you must type the letters that fall from the top of the screen.

Order No: **E03** Spelling and Time . . . **$12.95**

Functions & Fun

FUNCTION GRAPHER displays two arithmetic functions on the Hi-Res screen.
AUTOMATIC FUNCTION PLOTTER provides auto/manual scaling and graph overlays for plotting your favorite map functions.
DYNAMIC FUNCTIONS offers a pair of ampersand routines to convert strings to functions and then evaluate the converted string. Two demonstration programs are included.
SYSTEM SOLVER will solve any set of up to 70 linear equations with up to 70 unknowns.

Order No: **E07** Functions & Fun **$12.95**

Calc' Library

NIBBLE CALCULATOR turns the Apple into a full-function, programmable calculator with built-in arithmetic and trig functions, plus provisions for five user-defined programs.
UNIVERSAL METRIC CONVERTER converts English and metric units with menu-driven ease.
RPN CALCULATOR includes a visible "stack," error trapping, and help commands for a sophisticated graphics calculator.

Order No: **E10** Calc' Library **$10.95**

Arcade Sampler

'PILLAR MUNCH is a fast action survival game. If your 'pillar survives it will turn into a butterfly.
STORM WARNING lets you battle the forces of a Midwestern storm to rescue town people and rebuild their houses.
SPIN BALL provides arcade action with multiple balls, spinners and barriers.

Order No: **G03** Arcade Sampler **$9.95**

Sports Library 1

BADMINTON is a Hi-Res graphics simulation of tournament badminton.
GOLF PRO lets you design your own golf course and play the holes in Hi-Res graphics.
APPLE BOWL FOOTBALL is a fast moving text game that uses actual football statistics to produce a realistic simulation of the game.
FORMULA 1 is a Hi-Res racing game with five different track patterns, barriers and speeds.

Order No: **G07** Sports Library 1 . . . . . . **$9.95**

Adventurer

WILL O' THE WISP takes you on an adventure through forests, caves and castles to the den of Ralph, the magician.
CASTLE RICHE challenges you to find the fortune hidden in the adventure castle using text and Hi-Res graphics clues.
IDOL OF MONTEREY is a text adventure game in which you battle the monsters of the forest to regain the precious idol.
ADVENTURE CONSTRUCTION SET lets you design and play your own adventure games.

Order No: **G09** Adventurer **$11.95**

Cards

BRIDGE BIDDER pits you against your Apple in sharpening your bridge playing skills in Hi-Res graphics.
NIBBLE BLACKJACK gives you the excitement of Las Vegas style blackjack on the Hi-Res screen. The game includes splitting on pairs, doubling down, and five-card and six-card specials.

Order No: **G11** Cards **$10.95**

The Strategist

TANK COMBAT simulates World War II tank combat in a game of strategy and foresight. Defend your HQ against the enemy onslaught!
QUINTIC is a challenging five way tic-tac-toe. When you play against the computer, it learns your strategies as it plays.

BUDGET TRACKS

(continued)

THAT'S AMAZING tests your memory and sense of direction with 3-D mazes at various difficulty levels.
KRYPTO challenges you to deduce a sequence of invisible symbols. A game of logic and luck.

Order No: **G15** The Strategist **$10.95**

Applesoft Edit Library 2

APPLESOFT LINE EDITOR is a powerful utility that helps you write and edit Applesoft programs. Auto line numbering, insert, delete, and other commands allow you to directly edit program lines without having to retype or recopy entire lines. A must for your library!
APPLESOFT CROSS REFERENCE prints out four reports that list your programs' references to line numbers, variable names, literal values and constants. An invaluable debugging aid!
INVERSE KEYWORDS highlights every occurrence of a selected keyword in an Applesoft listing for easier program debugging. The program runs under DOS 3.3 with 64K RAM.
TEXT FILE UTILITY creates and edits text files easily with features that include line numbering, character insert and delete, and a range of disk options.

Order No: **P07** Applesoft Edit Library 2**$12.95**

Printer Manager

IMAGEWRITER AND SCRIBE CONTROL offer a range of sophisticated print options for the ImageWriter and Scribe printers.
PINSETTER lets you set the IIc serial ports directly from your programs, and keeps them set until you change them.
PRINTMASTER routines allow you to set up an AppleWorks-style file card menu on the 40-column screen, and enter and view printer codes.

Order No: **I03** Printer Manager **$12.95**

Disk Manager Library

APPLE DISK LIBRARIAN lets you get control of those big DOS 3.3 disk libraries. Handles up to 500 disks with sorting, editing, and search.
FILE NAME MOVER is a DOS 3.3 disk utility that lets you switch/exchange catalog names to put them in the proper sequence.
APPLE CATSUP catalogs a disk and provides a shorthand menu method for issuing DOS 3.3 commands with one or two keystrokes.
LIGHTNING COPY copies disks quickly with a two-drive system under DOS 3.3. You control the error handling for fast, foolproof copying, even with damaged disks.
VIGILANT FID lets you store the FID program in the RAM card area of memory and access it with a simple command for speed file manipulation under DOS 3.3

Order No: **D04** Disk Manager Library **$12.95**

DOS Customizer

DISK CUSTOMIZER for DOS 3.3 provides one-step formatting, volume header customization, and user selected hello program type.
DOS REMOVER physically removes DOS 3.3 from tracks one and two of your diskettes and frees up additional disk storage.
COMMAND CHANGER lets you physically change and shorten your DOS 3.3 commands.
DISK MASTER is a DOS 3.3 utility for recovering deleted files, catalog sorting, and direct track/sector examination.

Order No: **Q01** DOS Customizer **$10.95**

I/O Manager

SPOOLER keeps your printer busy while you keep computing. Uses the 16K RAM card area to store printer output as you work under DOS 3.3.
DISK DUMP provides a fast, simple way to dump selected or all DOS 3.3 disk files to your printer automatically.
APPLE SCROLLER puts right, left, and downward text scrolling at your fingertips in machine language.
TEXT FORMATTER prevents word wraparound of your printed text. Provisions for breaking between words in 30, 40, 70, and 130 column formats.
LUCK converts all your upper and lower case program text to upper case for easy formatting of listings.
SCREEN EDIT 80 lets you create 80-column text screens for display from your program. (Requires an Apple IIe, 64K).

Order No: **I02** I/O Manager **$12.95**

DOS Designer

DOS DESIGNER is a menu-driven system that allows you to change DOS 3.3 commands, create custom error messages, alter the disk volume heading, and more.
NEWSAVER DOS recovers Applesoft programs lost from accidental FP's and NEW's.
DOS EXTENDER makes your favorite machine language routine a permanent part of DOS 3.3.
DOS TRICKS lets you obtain disk boot statistics, read/write statistics, and create a "scratch pad" text file on DOS 3.3 disk for quick reference information.

Order No: **Q02** DOS Designer **$12.95**

Picture Programmer

SOUTHERN DRAW is a new precision "pencil" cursor for Hi-Res graphics.
HI-RES CHARACTER DRAWING makes text displays on the Hi-Res screen easy and quick.
HI-RES CRUNCH-DECRUNCH compacts Hi-Res pictures for efficient disk storage, then restores the data to its original size for Hi-Res display.
FANCY PICTURE LOADER provides spe ial effects for loading Hi-Res graphics.
LIFT OFF lets you save an area of the Hi-Res screen as a shape table.

Order No: **A06** Picture Programmer . . **$9.95**

Fun With Graphics

SUPER WEAVER simulates an 8 harness loop in high resolution graphics. Simple keyboard commands provide control and the pattern can then be printed as a complete draw-down.
BIORHYTHMS produces graphics biocharts and printed reports of your biocycles.
LO-RES HYPER-SCROLL provides fast 4-way scrolling of your screens. Produces spectacular screen displays.
COMPOSITE BIORHYTHMS shows your biocycles individually and combined in Hi-Res graphics.

Order No: **A07** Fun With Graphics **$9.95**

Tadpole Tutor

TADPOLE ALPHABET lets your preschooler learn the alphabet in an arcade style game.
BOUNCING NUMBERS is a fun Hi-Res number recognition program for preschoolers.
APPLE TIME TUTOR uses the Hi-Res screen with several clock formats and levels of difficulty for youngsters of different ages.
COUNTING QUIZ helps your preschoolers learn their numbers in Lo-Res and Hi-Res graphics.
FATHER'S FIRST PROGRAMS is a collection of four programs in graphics designed with children in mind.

Order No: **E02** Tadpol Tutor **$9.95**

Quasar+

QUASAR II puts you in command of a starship charged with clearing distant galaxies, meteors, and asteroids. A *Nibble* version of the popular "Asteroids" game.
CLAUSTROPHOBIA pits you against aliens from the sky who try to trap your gunner. Bring them down in neat columns at the edge of the screen to win.
SPACECADE challenges you to dodge the meteors as they fall faster and faster. It takes speed and agility to survive Spacecade!

Order No: **G02** Quasar+ **$10.95**

Sports Library 2

APPLE DARTS is a spectacular Hi-Res graphics dart game with two levels of play.
APPLE SLUGGER is a Hi-Res action baseball game. Pitch, bat, and field in your own home!
THE NIBBLE 500 challenges you to race for glory through a curving track with random obstacles and a pit stop.

Order No: **G08** Sports Library 2 . . . . . . **$9.95**

Trapper

TRAP 'EM pits you against three deadly beasts. Trap 'em before they eat you.
DIGGER lives beneath the sands of Mars. Help him outwit his adversaries in this Hi-Res arcade game.
PENGUIN is an arcade-style strategy game with increasing skill levels. Help Sammy the Penguin fend off the invaders to his little island! Sliding ice blocks are your weapons.
FLY AWAY lets you use a puffer gun to puff feathers, balloons, and other objects before they touch the ground. Arcade action!
LOW SCORE II pits your luck against the Apple's in a challenging dice game.

Order No: **G13** Trapper **$9.95**

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■ **JANUARY 1988 DISK — Message Center/Floppy Copy/Chinese Checkers/Hi-Res Circle Generator/Super Hi-Res Picture Packer**. . . Volume 9, Issue #1.

Order No: **W03**. . . Introductory price offer of **$12.95** expires 3/31/88. (New price will be $16.95.)

■ **DECEMBER 1987 DISK — Major Mayhem/Print Shop Label Maker/ProDOS MON and NOMON/Applesoft Variable Chart/Macro Magic**. . . Volume 8, Issue #12.

Order No: **W02**. . . Introductory price offer of **$12.95** expires 2/29/88. (New price will be $16.95.)

■ **NOVEMBER 1987 DISK — AmperPalette/Investment Calculator/Alter Doubler/GS Soft Switches/ImageWriter Color Control/ProDOS 8 Supports File Recovery**. . . Volume 8, Issue #11.

Order No: **W01**. . . Introductory price of **$12.95** expires 1/31/88. (New price will be $16.95.)

JANUARY 1987 DISKS

■ **Arcade Sound Editor** adds two-pitch sound effects to your programs for real arcade excitement. Specify two different pitches and the duration to produce a wide range of interesting, dramatic sound effects.
■ **Starlaser** makes you captain of a fast, laser-equipped starship. Battle the Kloryon starbases before your fuel supplies run out. Watch out! — they'll make their end runs from behind the meteor belt.
■ **The Stepper** is a step-and-trace debugger for 6502 machine language programs. Includes features to set break points, monitor memory locations, scan through several lines in succession and much more.

Order No: **X25**. . . **$29.95** + shipping

■ **The Reviewer** is a self-paced reviewer for students, combined with an editor for teachers. Use it to get practice in the subject of your choice.
■ **Disastep** lets you step through one machine language instruction at a time, or scroll through as many as you like. Simple keyboard commands control the debugger.
■ **ProDOS Position Command** updates the ProDOS position parameter so it can be used on files with fields longer than 239 characters.
■ **Applesoft Bandaids** installs fixes to the ten most annoying Applesoft BASIC bugs.
■ **Remote Control Apple Writer** prints your Apple Writer files, displaying all the embedded commands and control characters. Power users who write databases or print programs in WPL will love it. Requires Apple Writer.

Order No: **X26**. . . **$24.95** + shipping

FEBRUARY 1987 DISKS

■ **WindoWorks** creates animated Hi-Res screens. Make text flash, scroll, curve across the screen, and much more. You'll love these special effects!
■ **Financial Calculator** helps you make the nuts and bolts financial decisions. It calculates the interest on loans, future fund accounts, money markets, and scheduled deposit accounts.
■ **Surprise Attack** puts you in command during the outbreak of World War III. The game pits your skill and three defensive missile bases against an incoming horde of ICBMs. Your objective: the survival of the six cities under your protection.

Order No: **X27**. . . **$29.95** + shipping

■ **Machine Language Menu Master** adds the professional look of AppleWorks-type menus to your machine language programs. It holds up to 23 menu entries.
■ **Making It Perfectly Clear** demonstrates three neat, efficient screen wipes. You'll use them over and over in your own programs.
■ **ProDOS Spy** displays information about Machine Language Interface calls as they are executed.
■ **AS.CMDS** is Sandy Mossberg's disassembly of the ProDOS Applesoft program file commands.
■ **AppleWorks Client Billing** is a small business billing system with big features! It calcu-

lates past due interest charges and prints out invoices. Requires AppleWorks.

Order No: **X28... $24.95** + shipping

MARCH 1987 DISKS

■ **Garden Planner** lets you plan your garden graphically before you plant.
■ **Apple Writer Data Patcher** automatically date stamps your files.
■ **Ultra Fast Pix** retrieves Hi-Res pictures quickly.

Order No: **X29... $29.95** + shipping

■ **Applesoft Windows** opens text windows on the 80-column screen.
■ **Hi-Res SCRN Command** is a Hi-Res version of the Lo-Res SCRN command.
■ **DOS Device Detective** lets you find a DOS 3.3 file anywhere in your system, without specifying the slot or drive number.
■ **A Matter of Timing** shows you how to measure the speed of a 65C02 program.

Order No: **X30... $24.95** + shipping

APRIL 1987 DISKS

■ **DoubleDOS** gives you the freedom to switch between ProDOS and DOS 3.3 without losing the program in memory.
■ **Tape Library** is a dedicated database that lets you quickly access your entries for taped songs or movies.
■ **Barricade** lets you take turns lifting colorful blocks with an animated claw.

Order No: **X31... $29.95** + shipping

■ **Simple Speller** is an easy-to-use primer for preschoolers.
■ **Density Drill** has a built-in calculator to help elementary physical science students practice word problems.
■ **Chameleon** transforms your Hi-Res color pictures with a magician's flair.
■ **ProFRE** is a garbage collection routine borrowed from ProDOS for DOS 3.3 to avoid the usual delays.
■ **Text File Commands** is Sandy Mossberg's examination of the ProDOS commands that create and manipulate text files.

Order No: **X32... $24.95** + shipping

MAY 1987 DISK

■ **Outliner** is a thought processor that helps you get organized. Special printer features and cut-and-paste editing are included.
■ **Hi-Res Tricks** gives you 15 machine language routines for manipulating Hi-Res graphics.
■ **Apple X-Ray** lets you take a picture of your Apple's memory without destroying any programs.
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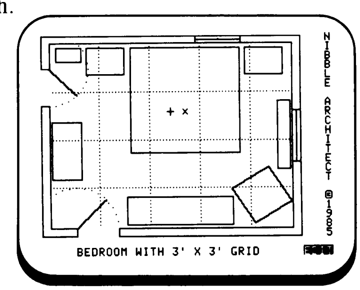
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continued from page 13

LISTING 1: Shape Table Leader Utility

```
BASIC.ASSEMBLER FILE STL

0300:          1        ORG $300
0300:          2 *
0300:          3 *      LEADER ROUTINE
0300:          4 *      FOR SHAPE TABLES
0300:          5 *      BY I. MCCALLUM
0300:          6 *
0300:          7 BEGADR EDU $AA72          ADDR WHERE M/L WAS LOADED
0300:          8 SHPTR  EQU $E8            SHAPE TABLE POINTERS
0300:          9 *
0300:18        10       CLC                CLEAR CARRY BIT
0301:AD 72 AA  11       LDA BEGADR         M/L ADDR. (LOW BYTE)
0304:69 10     12       ADC #16            ADD 16 BYTES
0306:85 E8     13       STA SHPTR          PLACE IN POINTER LOC.
0308:AD 73 AA  14       LDA BEGADR+1       M/L ADDR. (HIGH BYTE)
030B:69 00     15       ADC #0             ADD CARRY IF ANY
030D:85 E9     16       STA SHPTR+1        PLACE IN POINTER LOC.
030F:60        17       RTS                FINISHED
0310:          18 *
0310:          19 *     ATTACH THIS ROUTINE TO THE
0310:          20 *     BEGINNING OF A SHAPE TABLE
0310:          21 *     AND BRUN THE SHAPE TABLE
0310:          22 *     ANYWHERE IN MEMORY
0310:          23 *     SHAPE TABLE POINTERS WILL
0310:          24 *     BE SET AUTOMATICALLY.
```

until you obtain the desired one. Unfortunately, this is both error-prone and time-consuming, especially if numerous DATA statements exist in your program. Here's a routine (**Listing 2**) that allows you to RESTORE a specified DATA statement. Use **& linenum** and that DATA statement will be restored. You may also use variables and expressions to calculate linenum.

LISTING 2: RESTORE DATA Utility

```
10 A$="3F5:4C 0 3 N 300:20 67 DD
   20 52 E7 20 1A D6 B0 3 4C 7C
   D9 A5 9B E9 1 85 7D A5 9C E9 0
   85 7E 60 N D7D2G"
20 FOR I=1 TO LEN(A$): POKE 511+I,
   ASC(MID$(A$,I,1))+128: NEXT:
   POKE 72,0: CALL-144
```

Gary Chan Keng Hwee
Singapore

INVESTMENT CALCULATOR RETURNS

I have studied with interest (no pun intended) the feature article and Investment Calculator program by Eric L. Oshlo in *Nibble* (Vol. 8/No. 11). Since I am a consultant, I am compelled to pass on a few comments and cautions to you, to the author, and to anyone who uses the program for serious investment evaluations.

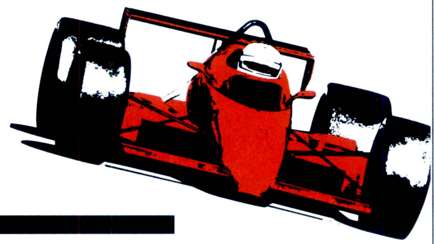
For some reason, Mr. Oshlo makes the internal rate of return (IRR) calculation and the present value/future value (PV/FV) calculations by two different methods. IRR is calculated by the continuous discounting method, and the PV/FV calculations are made with annual, periodic discounting/compounding. (This refers to the frequency of interest conversions.) Then he converts the calculated *nominal* interest rate of the IRR to an *effective* annual rate so as to correspond to the method used to calculate PV/FV.

For annual, periodic compounding and discounting, the nominal and effective rates of interest are the same. But as the compounding or discounting frequency increases, the effective rate of interest increases while the nominal rate remains constant. For example, money compounded quarterly at 10 percent nominal interest earns an effective rate of 10.38 percent, monthly compounding yields 10.47 percent, and both daily and continuous compounding yield 10.52 percent.

Most savings and loan associations today advertise either daily or continuous compounding. In his example for IRR, Mr. Oshlo reports the effective rate of return of 6.06 percent, but this corresponds to a typical savings account paying a nominal 5.88 percent, the IRR actually calculated in the program before "correction" in **line 770.**

Confusing? It certainly is to the average investor. And the program contains a lot of excess code just to make simple annual, periodic interest calculations. A single, user-defined function could have been used for all calculations. *continued on page 120*

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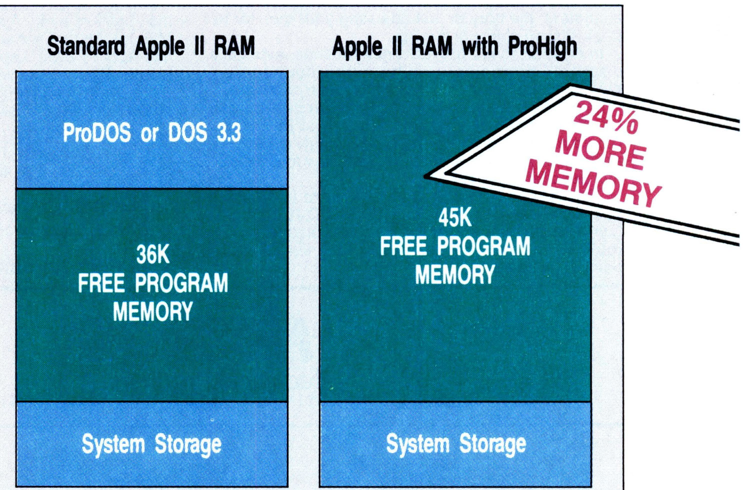
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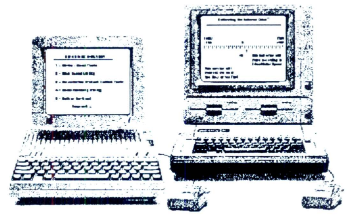
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LETTERS *continued from page 118*

Mr. Oshlo's program uses what is generally known as the *mid-year convention* for cash flows paid or received throughout the year, rather than a year-end lump sum. (The article fails to note that this requires a series of *equal* installments during the year.) This method is commonly used, even though it's a vestige of the days of the desktop calculator and compound interest tables. Standard equations are available to handle correctly the case of what is properly known as "uniform" flow, both for periodic and continuous compounding and discounting.

Finally, Mr. Oshlo states that the IRR assumes reinvestment of all cash flows at the calculated rate of return. While this is not entirely true, he is absolutely correct with the meaning he assigns to the IRR — that is, the effective rate of interest earned in the context of an interest-bearing account of some sort. And he gets around this potential reinvestment problem by including in the program the capability to calculate a *modified rate of return* (most call this a *growth rate of return*), wherein funds are reinvested at some different, specified rate of interest.

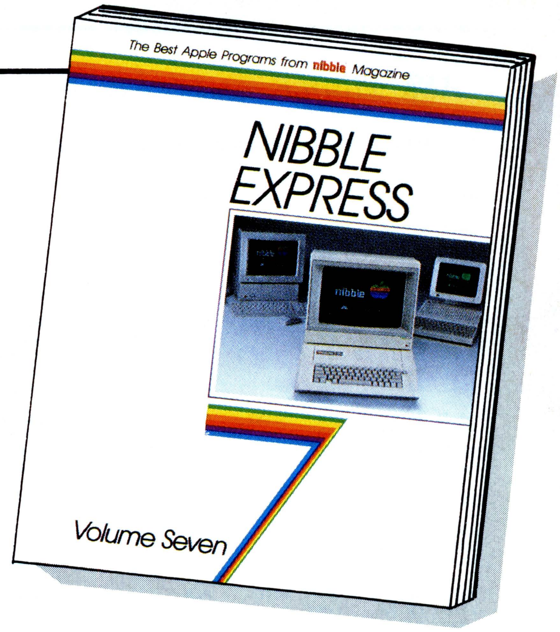
However, the IRR has two additional meanings, neither of which carry any reinvestment assumption. In the second sense, that used by lenders, the IRR is the interest rate payable on a note serviced by the annual cash flows. In Mr. Oshlo's example, the investments could be borrowed at 6.06 percent annual interest, the note would be repaid exactly by the positive cash flows, and $2,000 interest would have been paid.

The final meaning is that the calculated IRR is the interest paid on an annuity account, wherein the negative flows are paid into the account and the positive flows are received from the account. Here, the annuity owner is, effectively, the lender.

The chief problem with IRR is illustrated by a cash flow stream of the type in Mr. Oshlo's example. Any time there is more than one change of sign in the cash flow stream, there are multiple solutions for the IRR; that is, there is more than one discount rate which will result in a net present value of zero. In a practical sense, this is obviously an impossible situation. And, even more impossible, some of the roots can be imaginary numbers! Mr. Oshlo's example has three sign changes; the rule states that there are therefore either three or two real and imaginary roots (values for IRR).

It isn't correct to calculate the lowest real root and call it the IRR, as most computer programs do and as some "experts" would suggest. The IRR is simply not defined in such cases, but a simple solution can be had by calculating the net present value at the required or desired rate of return. If the net present value is positive, the IRR is greater than the discount rate used.

Field Roebuck
Dallas, TX



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MR ED takes the pain out of Applesoft line editing. This smart program editor features automatic numbering, line editing, and insert, delete and tab functions.

WINDOW SHOW lets you create Mac-like shadowed windows on the Hi-Res screen. Five easy commands are all it takes to add professional windowing to your programs.

TURTLE BASIC adds Logo-like turtle graphics commands to Applesoft for easy, fun graphic designs.

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THE FONT FOUNDRY is a character generator and editor that you can use to design one-of-a-kind Hi-Res character sets.

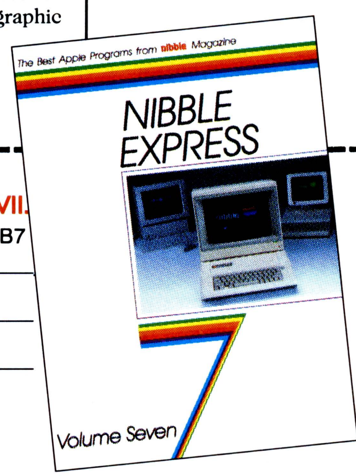
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ASK NIBBLE *continued from page 66*

LISTING 1: Shape Drawing Demo *continued*

```
8051: 20 11 F4  74           JSR   HPOSN      ; SET POSITION
                75
8054: A2 01     76  PREPARE  LDX   #1         ; SHAPE #1
8056: 20 30 F7  77           JSR   SHNUM      ; FIND ENTRY IN SHAPE TABLE
                78
8059: A9 00     79  XDRAW1   LDA   #$00       ; ROTATION = 0
805B: 20 61 F6  80           JSR   XDRAW      ; XDRAW THE SHAPE
                81
805E: AD 00 C0  82  GETKEY   LDA   KYBD       ; KEYPRESS?
8061: 10 FB     83           BPL   GETKEY     ; NOPE
8063: 8D 10 C0  84           STA   STROBE     ; CLEAR KEYBOARD
8066: 29 7F     85           AND   #$7F       ; CLEAR HI BIT
8068: 48        86           PHA              ; SAVE KEY VALUE
                87
8069: A6 06     88  POSN2    LDX   XPOS       ; LOW BYTE OF HORIZ.
806B: A4 07     89           LDY   XPOS+1     ; HI BYTE OF HORIZ.
806D: A5 08     90           LDA   YPOS       ; VERTICAL
806F: 20 11 F4  91           JSR   HPOSN      ; SET POSITION
                92
8072: A9 00     93  ERASE    LDA   #$00       ; ROTATION = 0
                94                            ; X,Y STILL SET UP
8074: A2 01     95           LDX   #1         ; SHAPE #1
8076: 20 30 F7  96           JSR   SHNUM      ; PREPARE TO XDRAW
8079: 20 61 F6  97           JSR   XDRAW      ; ERASE THE SHAPE
                98
807C: 68        99  MOVE     PLA              ; RETRIEVE KEY VALUE
807D: C9 0B     100          CMP   #11        ; UP ARROW = ^K
807F: D0 09     101          BNE   M2
8081: A5 08     102 UP       LDA   YPOS
8083: F0 C6     103          BEQ   POSN       ; DON'T CHANGE IF Y = 0
8085: C6 08     104          DEC   YPOS       ; Y = Y - 1
8087: 4C 4B 80  105          JMP   POSN
                106
808A: C9 0A     107 M2       CMP   #10        ; DOWN ARROW = ^J
808C: D0 0A     108          BNE   M3
808E: A5 08     109 DOWN     LDA   YPOS
8090: C9 9F     110          CMP   #159
8092: B0 B7     111          BCS   POSN       ; DON'T CHANGE IF Y = 159
8094: E6 08     112          INC   YPOS       ; Y = Y + 1
8096: D0 B3     113          BNE   POSN       ; ALWAYS
                114
8098: C9 08     115 M3       CMP   #8         ; LEFT ARROW = ^H
809A: D0 15     116          BNE   M4
809C: A5 07     117 LEFT     LDA   XPOS+1
809E: D0 04     118          BNE   L2         ; HIGH BYTE > 0
80A0: A5 06     119          LDA   XPOS
80A2: F0 A7     120          BEQ   POSN       ; DON'T CHANGE IF X = 0
                121
80A4: C6 06     122 L2       DEC   XPOS       ; X = X - 1
80A6: A5 06     123          LDA   XPOS
80A8: C9 FF     124          CMP   #$FF       ; WRAP-AROUND?
80AA: D0 9F     125          BNE   POSN       ; NO
80AC: C6 07     126          DEC   XPOS+1     ; DEC HIGH BYTE
80AE: 4C 4B 80  127          JMP   POSN       ; ALWAYS
                128
80B1: C9 15     129 M4       CMP   #21        ; RIGHT ARROW = ^U
80B3: D0 12     130          BNE   ESC
80B5: A5 07     131 RIGHT    LDA   XPOS+1
80B7: F0 06     132          BEQ   R2         ; HI BYTE = 0 => X < 256
80B9: A5 06     133          LDA   XPOS
80BB: C9 17     134          CMP   #<279
80BD: B0 8C     135          BCS   POSN       ; DON'T CHANGE IF X = 279
80BF: E6 06     136 R2       INC   XPOS       ; X = X + 1
80C1: D0 88     137          BNE   POSN       ; NO WRAP-AROUND
80C3: E6 07     138          INC   XPOS+1
80C5: D0 84     139          BNE   POSN       ; ALWAYS
                140
80C7: C9 1B     141 ESC      CMP   #27        ; ESCAPE KEY = QUIT
80C9: D0 80     142          BNE   POSN       ; ILLEGAL KEY - DON'T CHANGE
                143
80CB: 20 39 FB  144 EXIT     JSR   TEXT       ; BACK TO TEXT DISPLAY
80CE: 60        145          RTS
                146
80CF: 01 00 04  147 TABLE    HEX   010004     ; SHAPE TABLE DEFINITION
80D2: 00 12 3F  148          HEX   00123F
80D5: 20 64 2D  149          HEX   20642D
80D8: 15 36 1E  150          HEX   15361E
80DB: 07 00     151          HEX   0700
                152

--End assembly, 221 bytes, Errors: 0
```

END OF LISTING 1

INTERVIEW with . . . *continued from page 8*

A: SoftSwitch has only been out a few months (I'm addicted to it) and it lets you have three programs in the computer simultaneously. You can be in AppleWorks, for example, and switch immediately to Copy II Plus if you want to format a disk, or you can switch to the Apple desktop if you want to use a calculator. You can be in a program like PrintShop, which is DOS 3.3, and then switch to a ProDOS drawing program to edit some art work. It's like having three computers. It's so robust that even if one of the programs crashes, you can still go back to one of the other programs and throw away the crash!

Q: *How did you write a program like that?*

A: The program was written by Ken Kashmarek, who has contributed a number of articles to *Nibble.* For a living, Ken works for the John Deere Company. He's probably one of the most precise and knowledgeable software people I know. He's been around since the release of the Apple II and is intimately aware of how the Apple works.

Q: *How long did it take to write SoftSwitch?*

A: About a year. Ken Kashmarek got his IIGS around May or June of '86, and we released it in July of '87. One thing that SoftSwitch does is allow you to cut and paste screens between programs. To let a user move easily between two operating systems like that takes a lot of planning and skill. One interesting outgrowth of the capability to copy and paste the screen is that all of the screen shots that we used in the SoftSwitch manual, and some of our other manuals, were just screen dumps downloaded and then transferred to the Macintosh. SoftSwitch also spun off a macro program that, like SoftSwitch, can be used in any program. You can be in AppleWorks and use a set of macros, and then go over to MouseWrite or Managing Your Money and have another set of macros there. Our macro program is integral to the IIGS itself. You can use it in Pascal, DOS 3.3, ProDOS, or ProDOS 16. It's usable all over and is transparent to the operating system.

Q: *You know the technical side of computing and are also able to convey that knowledge in words, which is particularly interesting since you didn't have any computer training.*

A: My background is in high school math and science, which meant that I wasn't intimidated by technology. In fact, I'd only written one machine language program, Apple Doc, before I started writing the Assembly Lines column in *Softalk.* I think I had an advantage in that programming was so new to me, the problems associated with programming were fresh in my mind. They could be more easily addressed.

Q: *I know that you answer the technical questions in* Nibble. *Have there been any unusual questions directed to you?*

A: No, there have been no "weird" letters, but there have been many pleasant ones. I've gotten offers of mom's homemade jam and once I got an offer for a cold beer the next time I'm in some little town in Wyoming. That makes my day.

I also get letters that go into a great deal of detail in which the writer tells of his personal satisfaction in owning his computer. I found out that the Grateful Dead use Merlin and Herbie Hancock uses Apple Doc. NASA used ASCII Express on the space shuttle.

These are the accomplishments that matter more to me than having written a book. Knowing that programs are used and helping others is what really counts.

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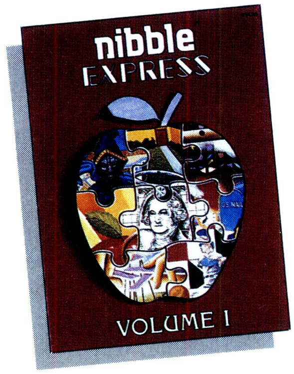
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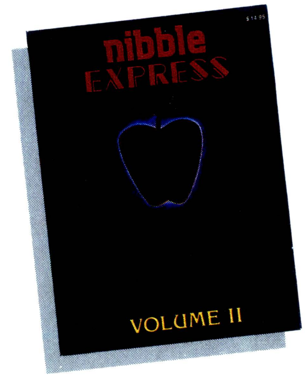
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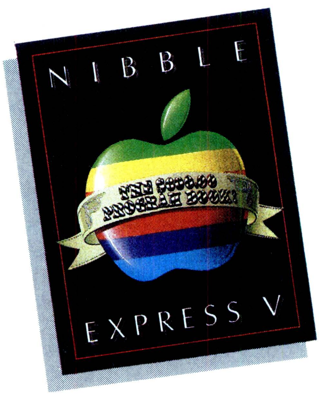


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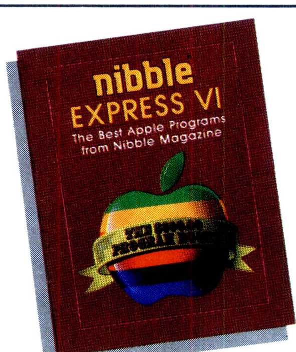
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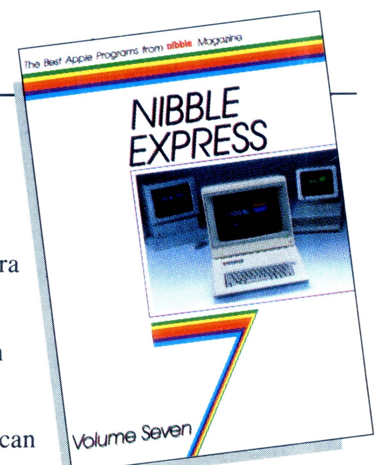
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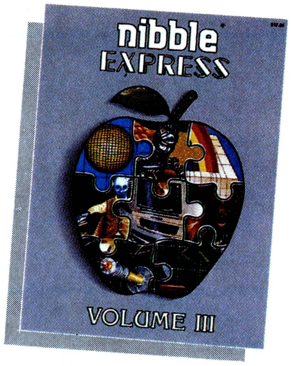
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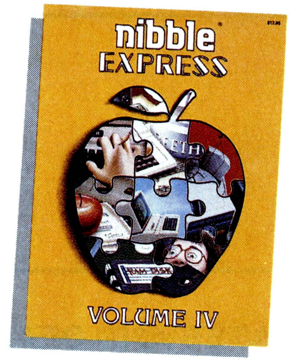
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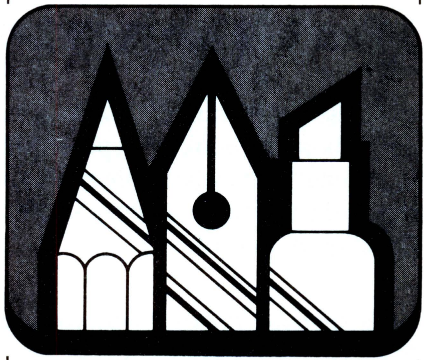
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